Tree Experts in the Built Environment

John Morris Arboricultural Consultancy

Tree Risk Assessments | Trees, Planning & Development | Expert Witness | Arboricultural Clerk of Works | Government Support

Client: GLL PRS Holdco Limited
Site: Proposed Strategic Housing Development
Kenelm at Deer Park
Howth
Co. Dublin

ARBORICULTURAL IMPACT ASSESSMENT & METHOD STATEMENT

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John Morris Arboricultural Consultancy

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Purpose of Document

This report provides an assessment of trees on land owned by GLL PRS Holdco Limited at Deer Park, Howth, Co. Dublin in accordance with the guidelines outlined in BS5837:2012 *Trees in relation to design, demolition and construction – Recommendations*.

It provides an overview of the constraints and opportunities posed by trees on or within influencing distance of the site and demonstrates how existing trees have influenced the development proposal.

It includes:

- A **Tree Schedule** that provides information for each tree;
- A **Tree Constraints Plan** that illustrates the location and constraints posed by trees;
- An **Arboricultural Impact Assessment** that considers the impacts of the proposed development to those trees, including proposals for arboricultural mitigation and improvements;
- An **Arboricultural Method Statement** that outlines how retained trees will be protected during construction, and;
- A **Tree Impact & Protection Plan** that illustrates the impact of the proposal upon trees and protection measures that should be adopted during construction.

The information contained within this report allows An Bord Pleanála to assess tree related issues associated with a Strategic Housing Development proposal upon the site.

Executive Summary

The proposal is for the construction of a residential Strategic Housing Development comprising 162 units across three blocks, with all associated site works on a greenfield site of 1.7438 ha.

A tree survey which was undertaken in accordance with BS5837:2012 *Trees in relation to design, demolition and construction - Recommendations* identified 108 individual trees, 10 group of trees and three hedgerow, which have been categorised as follows:

0 of high arboricultural quality	(Category A)
42 of moderate arboricultural quality	(Category B)
70 of low arboricultural quality	(Category C)
9 of poor arboricultural quality	(Category U)

The layout of the development proposal has been designed to ensure the protection and incorporation of trees located along the eastern boundary, which have been collectively identified as an important arboricultural feature that contributes to the landscape character of the local area. The aim has been to utilise these boundary trees as key features, to create a harmonious relationship between the existing natural infrastructure and the new built environment.

The development proposal will require the removal of 9 individual category B trees and part removal of two category B groups, 11 individual category C trees, one individual category U tree and part removal of one category U hedge/area of vegetation.

Four trees are recommended for removal irrespective of the proposed development, due to structural defects or irreversible decline that warrants them in such a condition that they cannot be realistically retained as living trees in the context of current land use for longer than 10 years, or due to high likelihood of failure that poses an unacceptable risk to persons or property.

The aim has been to avoid development that will result in the loss of trees from the clients lands, however where this has not been possible, a compensatory approach has been adopted that will see a diverse mix of new tree species planted across these lands. This proposed planting will occur across central areas of the lands to function in harmony with the proposed development and in the form of a new belt of native woodland, which will connect mature trees in the east to those along the golf course boundary in the south and west. This will result in a future increase in canopy cover within the local landscape and create a post-development situation that improves the long-term arboricultural quality of the lands.

The following measures are required to ensure the protection of retained trees during construction:

- Tree Protective Fencing & Barriers
- Construction Exclusion Zones

- Temporary Ground Protection
- Pollution Control
- Specialist Working Methods
- Arboricultural Monitoring & Supervision

CONTENTS

ATTACHMENTS

DOCUMENT TITLE	DOCUMENT REFERENCE
TREE SCHEDULE	19-279-01
TREE CONSTRAINTS PLAN	19-279-02
TREE IMPACT & PROTECTION PLAN	19-279-05
TREE ROOT INVESTIGATION REPORT	19-312-01

1. INTRODUCTION

Instruction

1.1. Instruction was received from GLL PRS Holdco Limited on 13th November 2019 to undertake a tree survey and prepare an arboricultural report in connection with a planning application for the construction of a residential Strategic Housing Development comprising 162 units across three blocks, with all associated site works, on land at Deer Park, Howth, Co. Dublin.

Scope

1.2. The survey has been carried out in accordance with BS5837:2012 *Trees in relation to design, demolition and construction – Recommendations.*

1.3. The information collected during the survey has been used in the preparation of this report.

Site

1.4. The site at Howth Road (hereinafter referred to as 'the Site') comprises a grass field and is immediately north of Deerpark Golf Course. The Site is separated from Deerpark Golf Course by a shelter belt of semi-mature and early mature native trees between 25 and 30 years old that extend east to west along the southern boundary. A boundary stone wall extends around the north and east perimeter of the Site, with a mature avenue of trees located beyond the eastern boundary. The Site is bound by Howth Road (R105) to the north, the entrance road to Howth Castle to the east, Deerpark Golf Course to the south and residential dwellings to the west. (Figure 1).

1.5. Adjacent to the Howth Road to the north, the Site is at a level of approximately +6.500m and gradually rises to a level of +14.000m towards the Deer Park Golf Course, with mature trees beyond the eastern boundary located on land that is c.840mm above the Site itself.

Figure 1. Application boundary outlined in red, extent of Applicants land ownership outlined in blue (Google Earth, 2020).

2. TREE SURVEY

Site Visit

2.1. The tree survey was undertaken on 21st November 2019.

2.2. Details of the survey methodology and assessment criteria can be found in Appendix 1.

2.3. A copy of the survey data can be found in the Tree Schedule (Ref: 19-279-01) attached to this report.

2.4. The extent of the tree survey has been marked on the Tree Constraints Plan (TCP) (Ref: 19-279-02) that accompanies this report

2.5. The tree survey considered all trees that have the potential to be impacted by any development proposals including those outside the application area, but within influencing distance.

2.6. The above ground constraints posed by canopy spread are plotted as a continuous line around the tree and shaded in the corresponding BS5837 retention category colour, whilst the below ground constraints posed by the Root Protection Area (RPA) have been plotted as a continuous magenta line with the text RPA inscribed.

2.7. The purpose of the tree survey was to provide guidance to the design team on the constraints and opportunities posed by trees to inform the design and layout of the Site.

2.8. The results of the survey allow the opportunity to balance the retention of significant trees against the opportunity to enhance the existing tree stock through proactive management.

2.9. A summary assessment of the tree quality is contained in Table 1.

Table 1. Overview assessment of tree quality.

	Category A	Category B	Category C	Category U	Total
Trees	0	39	62	9	**110**
Groups	0	3	7	0	**10**
Hedges	0	0	1	0	**1**
Total	**0**	**42**	**70**	**9**	**121**

Description of site

2.10. The main arboricultural features of the site include a mature avenue of trees to the east located along the entrance road to Howth Castle (outside the application area), and a younger woodland shelter belt to the south that forms a boundary between the Site and Deerpark Golf Course. A mature linear hedgerow wraps around the western boundary of the Site.

2.11. Those trees located to the east of the Site predominately comprise a mix of mature beech *(Fagus sylvatica)* and sycamore *(Acer pseudoplatanus)* with an understorey of ash *(Fraxinus excelsior)*, elder *(Sambucas nigra)* and laurel *(Laurus sp.)*. These trees are located on land that is c.840mm above the Site beyond the stone boundary wall and have collectively been identified as an important arboricultural feature in the local landscape.

2.12. The early mature shelter belt across the southern boundary of the Site comprises a mix of predominately native species that include Scots pine *(Pinus sylvestris)*, Downey birch *(Betula pubescens)* and oak *(Quercus petraea)* with occasional beech. The absence of the trees on the black and white aerial orthophotography image taken in 1995 indicates these trees have been planted sometime in the last 25 years (Figure 2) and are no more than 30 years old.

Figure 2. Black and white Aerial Orthophotography of Site taken in 1995 with location of early mature trees circled in red (Source: HeritageMaps.ie, 2021).

2.13. This boundary shelter belt of trees has been densely planted to provide visual screening and shelter to the golf course and would benefit from thinning to allow those species of better quality to develop and attain full size and form. Individually, they are of low arboricultural quality, however as a collective group of native species they are likely to offer greater ecological and biodiversity benefits. These trees are partially visible from beyond the site due to their elevated position in the local landscape. To the immediate south along the edge of the shelter belt and running parallel to the Deerpark Golf Course fairway is a linear feature of early mature alder *(Alnus glutinous)*.

2.14. To the west of the Site is a sparsely populated and unmanaged hawthorn *(Crateagus monogyna)* hedgerow with gaps that seperates the Site from residential dwellings to the west and provides a degree of immediate mature screening to the Site and neighbouring properties.

2.15. A small clustered group of young beech separated by a linear group of hawthorn, both of low arboricultural quality and likely to be planted within the last 15 years are located south of the site, and act as a design feature to provide separation between golf course fairways.

3. ARBORICULTURAL PRINCIPLES

Trees and Development

3.1. Trees provide a multitude of economic, environmental and social benefits to individuals and communities including (but not limited) to visual amenity and landscape value, ecosystem services and habitats for local wildlife. Trees can also hold historic and cultural importance by providing links to the past that create a sense of place and belonging.

3.2. They are living, self-optimising, mechanical organisms that grow in and react to the environment in which they are located and are capable of being wounded or infected by objects or other organisms that can cause a decline in health or result in death.

3.3. Development proposals that will impact trees should consider the value and contribution made by those trees, the impacts of development activity upon their health and an assessment of future conflicts that may arise between trees and the development proposal.

Below Ground Constraints

3.4. Soils contain organic and mineral material, air and water that provides a medium essential for root growth.

3.5. The physical properties of soils including texture, porosity and bulk density can greatly impact the availability of water, nutrients and oxygen in the soil available to support the function and growth of tree roots.

3.6. Protection of the soil environment in which trees grow is therefore essential to ensure tree vitality.

3.7. Tree roots provide support and anchorage and allow the uptake and transport of water, nutrients and oxygen for tree function and growth. Roots are commonly found in the upper 600-1000mm of soil, however depth can vary significantly depending on soil and local site conditions. Typically, tree root systems comprise a network of lateral roots that provide structural support and smaller fibrous roots that function in the uptake of water, nutrients and oxygen.

Impacts of Construction & Development

3.8. The processes of construction including the movement of machinery and equipment near trees can cause soil compaction that can starve roots of oxygen and water, resulting in tree decline or death. Increasing ground levels near trees can cause similar impacts, whilst belowground soil excavations can damage root bark or lead to root severance and impair structural stability. Further impacts include (but are not limited to) contamination of soils by toxic substances such as cement or chemicals and root desiccation due to inadequate protection during exposure.

Root Protection Areas

3.9. In accordance with BS5837, the Root Protection Area (RPA) indicates the notional minimum area of ground around a tree deemed to contain sufficient roots and rooting volume to avoid adverse physiological or structural impairment and to support future tree function, growth and

health.

3.10. The RPA is calculated in accordance with Section 4.6 of BS5837 and is summarised in Appendix 2.

3.11. The RPA is plotted as a continuous circle centred on the base of the stem, however where pre-existing site conditions such as the presence of built structures, changes in topography, soil type and structure or past management are likely to act as barriers, or alter normal distribution, BS5837 allows modifications to the shape of the RPA can be made based upon sound arboricultural assessment.

3.12. The default position should be that no development works occur inside RPAs, however in accordance with BS5837 when there is an overriding justification, it may be appropriate to implement specialist methods of construction or technical solutions that will reduce or eliminate the impact to roots and soil environments.

3.13. Additionally, where an area of RPA is lost, it should be demonstrated that the tree can remain viable with the area lost from encroachment compensated elsewhere contiguous with its RPA, based on the species, age, condition and past management of the tree, pre-existing site conditions and nature of operations proposed is undertaken.

Above Ground Constraints

3.14. Tree stems and crowns can restrict the availability of space on a development site that may result in conflicts between trees and the new built environment. The design and layout of a site should take into consideration the presence of tree canopies, as well as individual species characteristics and future growth requirements in order to create a harmonious relationship between trees and the new built environment.

4. PLANNING POLICY, STATUTORY & NON-STATUTORY CONSIDERATIONS

Planning Policy

4.1. The National Planning Framework 'Project Ireland 2040' and National Development Plan (2018-2027) underpin planning policy across Ireland. These documents recognise the need to manage future growth in a planned, productive and sustainable way.

4.2. At the heart of Green Infrastructure Planning is to protect, preserve and enhance national capital by:

> *"protecting and valuing important and vulnerable habitats, landscapes, natural heritage and green spaces".*

4.3. The Site falls within the jurisdiction of Fingal County Council (FCC), which has a statutory obligation to ensure that provision is made for the protection of trees, woodlands and hedgerows under the Local Government Planning and Development Act (2000), through implementation of a Development Plan. The current plan for Fingal is the **Fingal Development Plan (2017-2023)**.

4.4. The Fingal Development Plan (2017-2023) provides guidance for trees in relation to proposals of development as follows:

Fingal Development Plan 2017-2023

Chapter 3 | Placemaking

Objective PM64:

"Protect, preserve and ensure the effective management of trees and groups of trees".

Chapter 8 | Green Infrastructure 8

Objective GI16:

"Set targets in the Green Infrastructure Strategy for the provision of different green infrastructure elements in urban areas, such as trees in urban areas and green roofs in town centres, so that a net gain in green infrastructure is achieved over the lifetime of this Development Plan".

Chapter 9 | Natural Heritage

Objective NH27

"Protect existing woodlands, trees and hedgerows which are of amenity or biodiversity value and/or contribute to landscape character and ensure that proper provision is made for their protection and management".

Principles for Development

"Existing tree belts should be retained and managed and older stands of trees restocked. Roadside hedging should be retained and managed. Proposals necessitating the removal of extensive field and roadside hedgerows or trees should not be permitted. Strong planting schemes using native species, to integrate development into these open landscapes, will be required".

Chapter 12 | Development Management Standards

Tree Policy:

"Trees provide both valuable amenity and wildlife habitat. Visually they add to an area, softening the impact of physical development on the landscape while also fulfilling an important role in the improvement of air quality in urban areas and providing wildlife habitats. 'The Forest of Fingal –A Tree Strategy for Fingal' sets out the Council's policy for street tree planting, management and maintenance".

Objective DMS77:

"Protect, preserve and ensure the effective management of trees and groups of trees.

Objective DMS78:

"Ensure during the course of development, trees and hedgerows that are conditioned for retention are fully protected in accordance with 'BS5837 (2012) Trees in relation to the Design, Demolition and Construction – Recommendations' or as may be updated".

Objective DMS79:

"Require the use of native planting where appropriate in new developments in consultation with the Council".

Objective DMS80:

"Ensure trees, hedgerows and other features which demarcate townland boundaries are preserved and incorporated where appropriate into the design of developments".

Objective DMS81:

"Consider in tree selection the available rooting area and proximity to dwellings or business premises particularly regarding shading of buildings and gardens".

Objective DMS82:

"Promote the planting of large canopy trees on public open space and where necessary provide for constructed tree pits as part of the landscape specification".

Objective DMS83:

"Ensure roadside verges have a minimum width of 2.4 metres at locations where large trees are proposed and where necessary provide for constructed tree pits as part of the landscape specification. Road verges shall be a minimum of 1.2 metres wide at locations where small canopy trees are proposed".

4.5. **'The Forest of Fingal – A Tree Strategy for Fingal'** *(new strategy in public consultation until 28th March 2021)* is also a key consideration where trees are impacted by proposals of development.

4.6. The Fingal Development Plan (2017-2023) and 'The Forest of Fingal – A Tree Strategy for Fingal' have influenced the design proposals submitted as part of this application, by ensuring that the existing trees and hedgerows have been considered in the context of planning policy and retained where appropriate.

Tree Preservation Orders & Conservation Areas

4.7. Tree Preservation Orders (TPOs) may be made under Section 45 of the Local Government (Planning and Development) Act, 1963 and subsequent acts. Part XIII of the Planning and Development Act 2000 sets out the provisions for TPOs. A TPO can be made if it appears to the planning authority to be desirable and appropriate in the interest of amenity or the environment. A TPO can apply to a tree, trees, group of trees or woodland.

4.8. The principle effect of a TPO is to prohibit the cutting down, topping, lopping or wilful destruction of trees without the planning authority's consent. The order can also require the owner and occupier of the land subject to the order to enter into an agreement with the planning authority to ensure the proper management of the tree, trees or woodland.

4.9. A review of the FCC website did not allow a search for TPOs to be conducted, to ascertain if any TPOs exist upon the Site, however it is understood that trees east of the Site beyond the boundary stone wall at Howth Castle are shown as important trees for retention in the Fingal Development Plan (2017-2023) Sheet 10 Baldoyle-Howth (Figure 3). Trees on the Site itself are not shown on this plan.

Figure 3. Fingal Development 2017-2023 Plan Sheet 10 Baldoyle-Howth that illustrates important trees for retention. (Source: Fingal Development Plan 2017-2023).

Special Amenity Area Orders

4.10. A National Special Amenity Area is a designation for a landscape of national importance for its aesthetic/recreational value.

4.11. Planning authorities are empowered (under section 202 of the Planning and Development Act 2000), to make a Special Amenity Area Order (SAAO) for reasons of outstanding natural beauty or its special recreational value and having regard to any benefits for nature conservation. The purpose is to preserve/enhance landscape character and to prevent/limit development.

4.12. A review of the Fingal County Council Development Plan (2017-2023) indicates that the area zoned 'High Amenity' to the south of the Site that covers an area of 0.58ha is within the buffer zone of Howth SAAO (Figure 4). The SAAO designation does not apply to all of the clients lands.

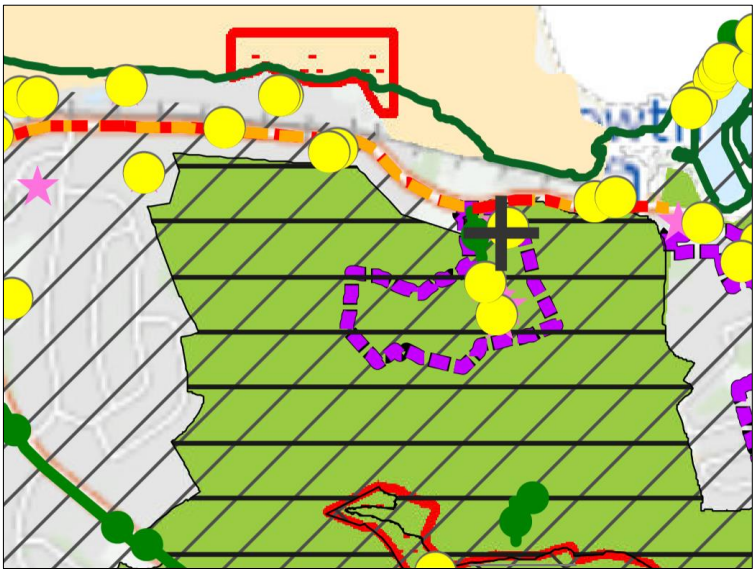


Figure 4. Fingal Development Plan (2017-2023) Sheet 14 Green Infrastructure 1 that illustrates High Amenity lands are within Howth SAA buffer zone (Source: Fingal Development Plan 2017-2023).

Felling Licences

4.13. It is an offence for any person to uproot or cut down any tree unless the owner has obtained permission in the form of a felling licence from the Forest Service, with the exception of the following scenarios (under section 19 of the Forestry Act 2014):

- A tree in an urban area. (An urban area is an area that is comprised of a city, town or borough specified in Part 2 of Schedule 5and in Schedule 6 of the Local Government Act 2001, before the enactment of the Local Government Reform Act 2014 (this act

  dissolved Town Councils, however, the old boundaries of these areas are still considered as urban for the purpose of the Forestry Act 2014).

- A tree within 30 metres of a building (other than a wall or temporary structure) but excluding any building built after the trees were planted.

- A tree less than 5 years of age that came about through natural regeneration and removed from a field as part of the normal maintenance of agricultural land (but not where the tree is standing in a hedgerow).
- A tree uprooted in a nursery for the purpose of transplantation.
- A tree of the willow or poplar species planted and maintained solely for fuel under a
- short rotation coppice.
- A tree outside a forest within 10 metres of a public road and which, in the opinion of the owner (being an opinion formed on reasonable grounds), is dangerous to persons using the public road on account of its age or condition.
- A tree outside a forest, the removal of which is specified in a grant of planning permission, providing it was indicated on the lodged plans as being planned for removal as part of the application
- A tree outside a forest of the hawthorn or blackthorn species growing in a hedge.
- A tree outside a forest in a hedgerow and felled for the purposes of its trimming the hedge providing that the tree does not exceed 20 centimetres diameter at 1.3 metres above ground level.
- Agricultural holdings can fell a limited small number of trees not exceeding 3 cubic metres.
- The maximum number of trees permitted to be felled under that exemption per year is 4 trees (12 cubic metres)
- Outside a forest, apple, pear, plum, or damson species are exempt from the need for a felling license.

Wildlife

4.14. The cutting or felling of trees is prohibited during the period 1st April to 31st August every year with limited exceptions under the Wildlife Acts 1976-2008.

5. ARBORICULTURAL IMPACT ASSESSMENT

Development Proposal

5.1. The design rationale is to create and deliver a high quality, sustainable, strategic housing development which respects its setting and maximises the site's natural attributes while achieving maximum efficiency of existing infrastructure. The Proposed Site Layout is illustrated on **Drawing No. 1101** contained within the architectural suite of drawings.

The development will consist of;

i. 162 no. residential units distributed across 3 no. blocks (A, B & C) ranging in height from 5-6

storeys, with a cumulative gross floor area (GFA) of 13,337.10 sq.m comprising;

a. 29 no. 1-bedroom units, - 17.9%
b. 104 no. 2-bedroom units and – 64.2%
c. 29 no. 3-bedroom units – 17.9%

ii. 3 no. resident services and amenity rooms (1 no. in each block A-C) to accommodate co-working space, a community room and a meeting room (combined GFA 108 sq.m)
iii. 132 no. car parking spaces at basement level (underlying Blocks A & B) including 6 no. accessible spaces, 13 no. electric vehicle spaces and 4 no. car sharing spaces;
iv. 325 no. residents bicycle parking spaces (long-stay) at basement level, and 30 no. visitor bicycle parking spaces (short-stay) at surface level;
v. communal amenity space in the form of courtyards and roof gardens (combined 2,192 sq.m)
vi. public open space of 1,161 sq.m including a botanic garden and pocket park;
vii. a single storey ESB sub-station and switch room (45.5 sq.m);
viii. demolition of 2 no. sections of the existing demesne northern boundary wall to provide, a primary access (vehicular/pedestrian/cyclist) to the northwest and a separate pedestrian/cyclist access to the northeast;
ix. restoration and refurbishment of the remaining extant northern and eastern demesne boundary wall;
x. change of use and regrading of part of the Deer Park Golf Course from active recreation use to passive amenity parkland;
xi. undergrounding of existing ESB overhead lines, and, relocation of the existing gas main; and,
xii. all ancillary site development works including waste storage and plant rooms at basement level, drainage, landscaping/boundary treatment and lighting.

Design Principles

5.2. The design layout has been directly and indirectly influenced by the existing tree cover on site. The default position has been to avoid development within the canopy or RPA of any retained tree, however where this has not been possible a hierarchy of mitigation has been applied, as illustrated in Figure 5.

Design Consultation & Iteration

5.3. The initial proposed layout of block C and the basement were originally located in close proximity to trees along the eastern boundary. To enable the design team to understand the actual constraints posed by trees due to elevated levels in this area of the site (land is c. 840mm higher east of the stone boundary wall), a root investigation was undertaken on 22nd January 2020. The Root Investigation was undertaken using an Air-Spade and involved belowground excavations at various predetermined locations in proximity to the eastern site boundary.

5.4. A copy of the Root Investigation Report (Ref: 19-312-03) that provides details of the scope,

methodology and results of the investigation is attached to this report.

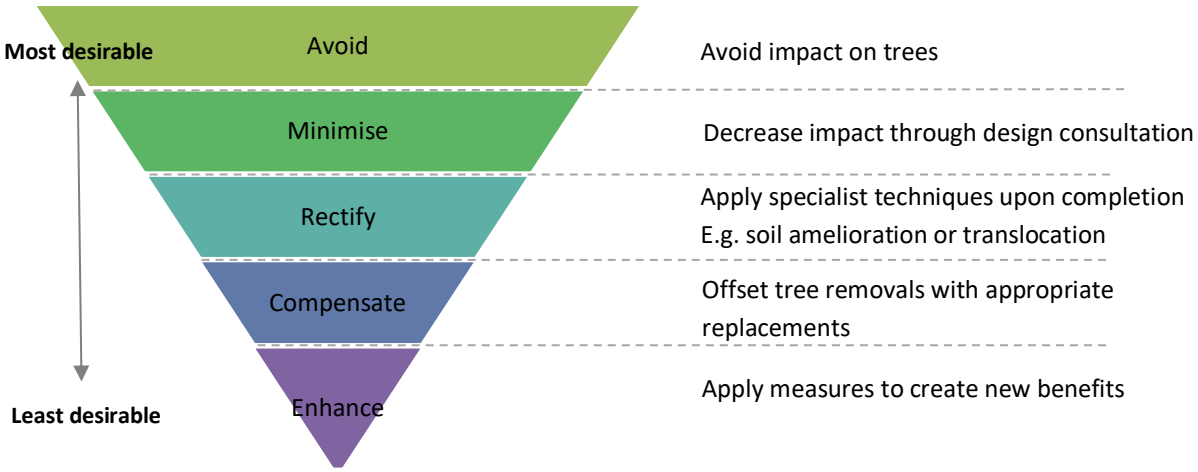


Figure 5. Trees and Development Mitigation Hierarchy (John Morris Arboricultural Consultancy, 2020).

5.5. The results of the investigation enabled the design team to create a series of terraces that were considerate of existing tree roots, to avoid any adverse impact on the health and condition of trees along the eastern boundary. The results of the investigation also allowed the retention and protection of further trees in this area of the Site.

5.6. Design consultation to mitigate for the loss of the shelter-belt along the boundary of Deerpark Golf Course has significantly increased the number of new trees to be planted across the lands, by way of a new native woodland shelter belt along the western and southern boundaries. This native woodland feature will connect mature trees in the east with those that extend along the Deerpark Golf Course boundary in the west and south and is likely to improve the long term arboricultural and ecological biodiversity of the Site and increase future canopy within the local landscape. The approach to this layout has been a result of a multi-disciplinary approach and liaison between the project team with input from the landscape architect, arboriculturist and ecologist.

Tree removals and pruning

5.7. Tree removals and pruning have been limited to that which is necessary and unavoidable to allow the development proposal to be implemented, with consideration given to species attributes, the tolerance of individual trees to disturbance, and to the presence of surrounding trees and features of the site which may have an influence on retained trees.

5.8. The pruning of trees may be required for reasons of good arboricultural practice or management to promote tree health and longevity, to remove hazards for reasons of health and safety, or to limit the impacts of the development proposal upon trees where incursions into RPAs are unavoidable.

5.9. The proposal will require the removal of 21 individual trees, part removal of two groups of trees and part removal of a single hedge/area of vegetation.

5.10. A summary of tree removals with reasons for removal and impact of removal, by BS5837 retention category can be found in Table 2.

Table 2. Summary of tree removals and impact of removal.

Tree Nos.	Category	Reason for removal	Impact of removal
1 & 2	Category C	Trees are located within footprint of new vehicular entrance into development proposal.	One tree is located in a grass verge on Howth Road. The other is located behind a stone wall within the Site. The removal of tree 1, which is a mature Rowan *(Sorbus aucuparia)* will have a short term impact. It is proposed to replace this low quality tree with a new tree of better quality. Tree 2 is an early mature Rowan, located on the Site behind a stone wall. It is not visible from beyond the Site and its removal will have a short term impact. It is proposed to replace this low quality tree with a new tree of better quality. *
68	Category B	Tree is located within footprint of new substation.	The removal of this early mature sycamore will have a short term impact. It is proposed to replace this tree with a new tree along the boundary of the Site. *
H67	Category U	Hedge/vegetation is within footprint of new substation.	This poor quality hedge and understorey vegetation is sparse with gaps and in severe decline. It is proposed to remove a small section of hedge and then replace, enhance and supplement the existing hedge with new planting and maintenance to significantly improve its quality. This

			approach will improve and safeguard the hedge as a green corridor around the western boundary of the Site. *
97-101, G102 105-107	Category C	The topography of the land will reprofiled in this area of the Site to facilitate the proposal.	The removal of these trees/groups will have a short term impact. It is proposed to mitigate their removal with new tree planting around the west and southern boundaries that will increase the number of trees upon the Site, therefore providing an increase in canopy cover and new green/ecological corridors that will strengthen the boundary of the Site. *
G103, G104 & 113-120	Category B		
**Indicates that mitigation measures are proposed to reduce the impact of removals and/or improve the post-development arboricultural, ecological and landscape quality and value of the site (see Mitigation & Improvements).*			

5.11. Figure 3 summaries tree removals by age class.

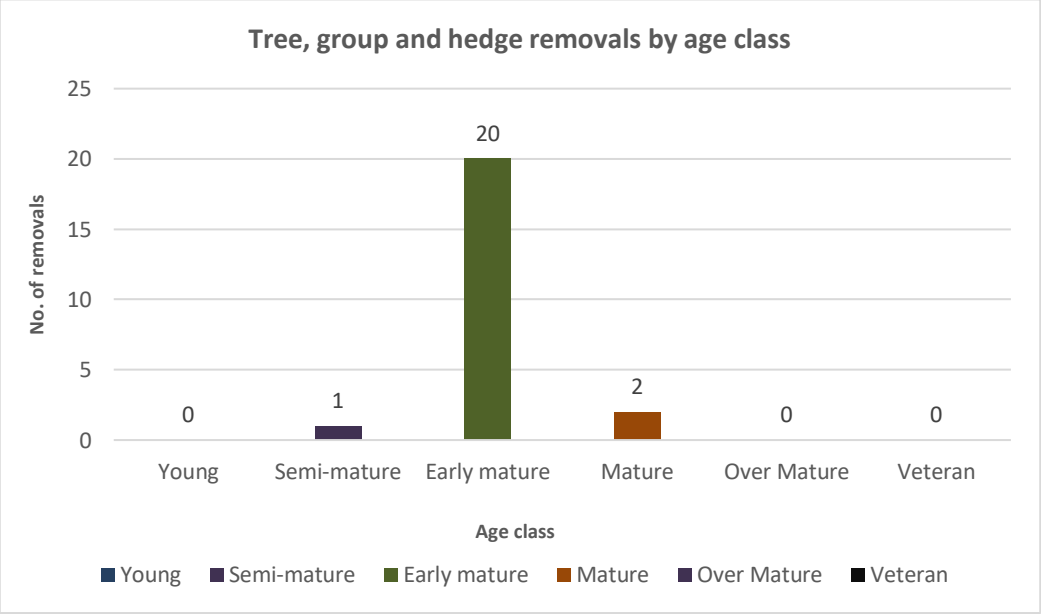


Figure 3. Summary of tree removals by age class.

5.12. A total of three trees are recommended for removal irrespective of the development proposal, due to severe physiological or structural decline that means they cannot realistically be retained in the context of current land use for longer than 10 years, or due to a high likelihood of failure that poses an unacceptable risk to persons to property.

5.13. Those trees to be removed are illustrated on the Tree Impact & Protection Plan (TIPP) (Ref: 19-279-05), that accompanies this report.

5.14. All tree works are outlined in the Tree Schedule attached to this report and should be undertaken by a qualified and insured contractor in accordance with BS3998:2010 *Tree Works – Recommendations.*

Ground Levels & Incursions within RPAs

5.15. There is a requirement for a minor incursion within the theoretical RPA of trees along the eastern boundary to allow the creation of new terraces. The results of the Root Investigation found that very few roots belonging to trees beyond the eastern boundary stone wall have grown beneath the wall and onto the Site. Those roots found during the investigation were less than 25mm in diameter and any disturbance will have no adverse impact on the health or condition of these trees.

5.16. To ensure there is no impact to trees, it is recommended that the creation of terraces is undertaken under the supervision of a project arboriculturist.

Construction Phase

5.17. All site compounds, facilities and routes to allow the movement of construction traffic across the Site will be sited outside influencing distance of RPAs for all retained trees and hedges.

Mitigation & Improvements

5.18. The aim has been to include those arboricultural features that are capable of providing a substantial future contribution in terms of their amenity, landscape and ecological value, including those that contribute to the landscape character of the local area.

5.19. To mitigate the removal of arboricultural features, it is understood that a landscape plan submitted as part of the application will propose a diverse mix of new trees and vegetation across the Site to function in harmony with the proposal.

5.20. This new planting will include a varied age and mix of tree species that are chosen with consideration to local site and environmental conditions, native environment, provision of ecosystem services and contribution that can be made to local area.

5.21. Part removal of the central shelter belt that forms an extended boundary along Deerpark Golf Couse is likely to have a short-term impact on arboricultural value of the Site, however in the long-term, new tree planting to compensate for its loss will provide an increase in canopy cover that will positively contribute to the long term arboricultural, landscape and ecological value of the site.

5.22. A diverse mix of new tree planting is proposed across central areas and along the northern boundary of the site to function in harmony with the new development. It is understood that this planting will include a mix of native and non-native species to create a diverse and resilient new tree population. Those trees located on the rooftop gardens will also include pollinator friendly species in recognition of Fingal County Councils partnership status in the All Ireland Pollinator Plan 2015-2020.

Hedgerow Management Plan

5.23. The following guidance is recommended for the enhancement and maintenance of the existing hedge (H67) along the western boundary of the Site.

Priorities

5.24. A priority of the hedgerow management plan should be the planting of a new hedge, infilling gaps and creating new extensions to hedge lines that have been removed to accommodate the new pedestrian access.

5.25. A further priority should be the ongoing maintenance of the existing and new hedge, ensuring the success of the newly planted stems and continued management of existing hedgerow.

Supplementary planting

5.26. The planting of a new hedge should be completed following completion of any construction work to avoid damage to roots, which may impair physiological function and establishment of the hedge.

5.27. This should be planted at 5 plants per metre, as a double-staggered row. Plants will establish best as 60 – 80 cm transplants, protected from browsing mammals by 75cm spiral guards, supported by a 90 cm cane.

5.28. The hedge should consist only of native species, to ensure aesthetic appearance of the existing hedge is preserved, additionally providing ecological habitat for existing wildlife.

Laying

5.29. November to February is generally the best time to plant; however, if planting into clay soils wait until March. Planting should not be undertaken in freezing weather or waterlogged ground. If planting into a newly restored earth bank, plant the following autumn.

5.30. To undertake hedge planting successfully prepare the ground so the soil becomes friable (has a crumbly texture) and is free of other growth.

5.31. Control competitive weeds (including brambles, nettles and grasses) during the first growing season. These weeds reduce the growth rate of the new plants by competing for soil moisture, nutrients and light.

5.32. Plants should be fenced off to avoid trampling or damage. Fences should be kept far enough away so the hedgerow can grow at least 1.5m in width.

Cutting

5.33. The newly planted hedge should not be cut for the first 2-3 years, to allow establishment.

5.34. Once the hedge becomes established maintenance should usually be carried out by persons using handheld equipment or tools on an annual cycle.

5.35. Cutting incrementally, rather than trimming back to the same point, allows hedges to increase in height and width by several centimetres at each cut, encouraging a dense, healthy hedgerow.

5.36. To avoid disturbance of nesting birds and sustain production of winter bird food, cutting should be scheduled to take place between March and October each year.

5.37. The hedge will be the responsibility of the landowner and will be maintained as such in compliance with the Section 70 of the Roads Act 1993 to ensure the following:

- growth does not obscure the view of road signs.
- visibility is maintained for road users, particularly at junctions and on the inside of bends.
- trim any hedge that directly abuts a road, footway, cycleway or public right of way so that growth does not prevent the passage or affect the safety of highway users, including cyclists and pedestrians.
- remove dead or decaying growth that may fall across the highway.
- remove branches and other growth that may prevent the passage of high sided vehicles or obstruct light from a streetlight.
- ensure the highway (including the footway and drainage features) is left clear of debris from the cutting operations.

Magnitude of Impact

5.38. The overall magnitude of impact for proposed tree removals has been assessed using the criteria in Table 4.

Table 4. Magnitude of arboricultural impact (John Morris Arboricultural Consultancy 2020).

Magnitude Rating	Description of Impact	Mitigation
High	Major loss or alteration to the main arboricultural features or characteristics of the site that will result in a post-development situation that is significantly different.	Realistic and feasible mitigation measures should be implemented that will reduce the magnitude of impact within a reasonable
Medium	Partial loss or alteration to the main arboricultural features or characteristics of the site that will result in post-development situation that is partially different.	

Low	Minor loss or alteration to the main arboricultural features or characteristics of the site that will result in a post-development situation that is similar to before.	timeframe and/or create a post-development situation that improves on the pre-development baseline.
Negligible	Very minor loss or alteration to the main arboricultural features that will result in a post-development situation that is unchanged.	
None	No loss or alteration to arboricultural features.	

5.39. The proposed layout will require part removal of a main arboricultural feature or characteristic of the Site and as such the magnitude of impact will range within the upper category of medium to high.

5.40. This arboricultural feature includes early mature trees that form part of the shelter belt across the southern boundary of the Site. The absence of these trees in the black and white aerial orthophotography image taken in 1995 (Figure 2) indicates these trees have been planted sometime in the last 25 years and are around 30 years old.

5.41. The applicant proposes to plant a significant number of new trees on their lands by way of a new native woodland shelter belt along the western and southern boundaries. This native woodland feature will connect mature trees in the east with those that extend along the Deerpark Golf Course boundary in the west and south and is likely to improve the long term arboricultural and ecological biodiversity of the Site and increase future canopy within the local landscape. The approach to this layout has been a result of a multi-disciplinary approach between the project team with input from the landscape architect, arboriculturist and ecologist.

5.42. The application of these feasible and realistic mitigatory measures will ensure the magnitude of impact is significantly reduced within a reasonable period of time, and that within 25-30 years of planting, there will be a increase in canopy cover in the local landscape. Therefore, the long-term result will be an improvement on the pre-development baseline.

6. ARBORICULTURAL METHOD STATEMENTS

Purpose

6.1. The purpose of this statement is to provide a system of working to ensure retained trees are protected at all times during construction. It should be read in conjunction with the Tree Impact & Protection Plan (TIPP) attached to this report.

6.2. A copy of this report must be made permanently available for the duration of the development. It can be:

- Included in tender documents to identify and quantify tree protection and management requirements;
- Used to plan timing of site operations to minimise the impact upon trees, and;

- Referenced on site for practical guidance on how to protect trees.

6.3. The compliance of arboricultural method statements is a recommended as a condition of planning and is necessary to ensure the protection and vitality of retained trees.

Pre Commencement Meeting

6.4. A pre-commencement meeting will be held prior to commencement of any demolition or construction works on site. The pre-commencement meeting may require the attendance of:

- The Main Works Contractor;
- Landscape Architect;
- Structural/Civil Engineer;
- Project Arboriculturist; and
- Any other parties as required.

6.5. The purpose of this meeting will be to agree the details of the tree protection measures and ensure that all aspects of tree protection are understood. The Project Arboriculturist and Main Works Contractor will agree and mark the location of the tree protective fencing and temporary ground protection and any other specific tree protection measures, as required.

Monitoring

6.6. Once works commence upon the site the role of the project arboriculturists role will switch to monitoring compliance with arboricultural planning conditions, provision of advice in relation to tree related matters and supervision of sensitive works that may impact upon retained trees.

Key Responsibilities

6.7. It is the responsibility of the main contractor to ensure that all site personnel fully understand the protection measures on the site, that tree protection measures are adhered to at all times, and that the project arboriculturist is contacted if there are any issues related to trees.

Tree Protective Fencing

6.8. A protective fence will be erected around retained trees, prior to the commencement of materials or machinery being brought onto site, removal of soil or any form of construction. The area within this fencing will form the construction exclusion zone (CEZ) and it will be afforded protection at all times. No works will be undertaken within this zone that causes compaction to the soil, severance of tree roots or damage to tree canopies.

6.9. The fence is to be sited in accordance with the TIPP attached to this report.

6.10. Details of the minimum distance for fencing from trees can be found in the Tree Schedule attached to this report.

6.11. The precise form of fencing can vary provided it is fit for purpose and prevents damaging activities within the CEZ. For a proposal of this nature, a number of fencing/protection solutions

will be required including the Heras 151 system of fencing, timber boards and hessian sacking wrapped in chestnut cleft pale.

6.12. Details of the various types of fencing is provided in Appendix 2.

6.13. The fence will have signs attached to it stating that it defines a CEZ and that no works are permitted beyond it.

6.14. An example of a tree protection sign is provided in Appendix 3.

6.15. The protective fencing may only be removed following completion of all construction works.

6.16. The following principles will be adopted by site personnel within the CEZ during construction, to ensure protection of retained trees:

- No level changes.
- No excavations.
- No fires.
- No use of herbicides.
- No storage of materials, machinery or access for construction workers.

Tree Protective Barriers (Street Trees)

6.17. Where it is not feasible to erect Heras 151 fencing due to space restrictions (e.g. public footpaths or central reservations), a hessian wrap surrounded by a cleft chestnut pale fence or plywood boards to a minimum thickness of 20mm, securely held in place by a scaffold framework or 4x2 timber frame that is set back a minimum of 500mm from the stem and to a height of 2.4m will provide the necessary protection.

6.18. The existing hard surface must remain in place to protect tree roots and the surrounding soil environment.

Site Compounds & Facilities

6.19. Site compounds and facilities will be located outside of all RPAs and CEZs as identified on the TIPP.

Site Cranes, Piling Rigs and Machinery

6.20. The location of all site cranes, piling rigs and other machinery should be sited outside of RPAs to avoid soil compaction.

Pollution Control

6.21. Any storage or mixing station located outside of the construction exclusion zone will be located in a place that minimises the risk of contaminated runoff entering to prevent adverse physiological impacts on trees that may result from contact with rooting environments. This may be achieved by using a non-permeable membrane on the ground, surrounded by sandbags or sawdust to contain any spillage.

Temporary Ground Protection

6.22. Where it is not practical to protect RPAs by use of protective fencing, BS5837 allows for the fencing to be set back and the soil shielded by ground protection. A range of methods can be used including retaining existing hard surfaces or structures that already protect the soil, installing new temporary surfaces, or a combination of both. Whatever the choice of method, the end result must be that the underlying soil remains undisturbed and retains the capacity to support existing and new roots.

6.23. If fences are to be set back on a temporary the following specifications are recommended for use as temporary ground protection to protect roots and soil.

6.24. For pedestrian traffic, a plywood board with a minimum thickness of 40mm should be laid on a minimum of 100mm deep woodchip, with geotextile membrane beneath.

6.25. For small plant machinery with a gross weight of up to 2 tonne, interlinking aluminium or composite tracks with sufficient load bearing capacity should be laid on a minimum of 150mm deep woodchip, with geotextile membrane beneath.

6.26. For heavy machinery with a gross weight of up to 3.5tonne, interlinking aluminium or composite track with sufficient load bearing capacity should be laid over a minimum layer of 200mm deep woodchip, with a geotextile membrane beneath.

6.27. An example of temporary ground protection measures can be found in Appendix 4.

6.28. Any temporary protective surfaces must remain in place until all construction activity is finished.

6.29. Upon completion of construction works, the temporary ground protective measures should be removed working backwards from on top of the system. This will need to be done carefully to ensure that there is no excavation or compaction of the original surface or change in ground levels.

6.30. Once this material has been removed vehicular access to this part of the site will not be permitted.

Installation of Lighting Columns / Railings / Fences

6.31. The erection of a new posts or lighting columns will require 'hand-digging' in the location where any foundations or posts are required within RPAs, to prevent damage to tree roots.

6.32. Any soil removal during excavations must be undertaken with care to minimise root disturbance and avoid any damage to root bark.

6.33. Exposed roots that are to be removed should be cut cleanly with a sharp saw or secateurs 10-20mm behind the final face of the excavation.

6.34. Roots greater than 25mm diameter should only be cut in exceptional circumstances and following approval by the project arboriculturist.

6.35. Fibrous clumps of roots must be retained where possible, with any exposed roots protected

from desiccation by covering them with a damp hessian sack or damp sharp sand (**builders' sand must not be used**).

6.36. Prior to backfilling, roots must be surrounded with topsoil or sharp sand before the excavated earth is replaced. The soil must be free of contaminates and any foreign objects that may be potentially harmful to roots.

Installation of Services

6.37. All services and utilities will be installed within existing service routes and where possible outside of RPAs.

6.38. Where installation of utilities or services is required within RPAs, working practices will be adopted in accordance with the National Joint Utilities (NJUG) 10, Vol 4, Issue 2, 2007 'Guidelines for the Planning, Installation and Maintenance of Utility Apparatus in Proximity to Trees'.

6.39. In accordance with 4.1.3 of NJUG 10 2007, acceptable techniques in order of preference include: a) Trenchless; b) Broken Trench; and c) Continuous Trench. Trenchless methods involve the use of thrust boring machinery, whilst broken and continuous trench methods require that excavations within RPAs are carried out using hand tools only.

6.40. For a proposal of this nature, broken or continuous trench methods are the most appropriate and should be employed as per NJUG 10, to prevent any damage to tree roots or disruption to soil rooting environments.

Soft Landscaping

6.41. To avoid damage to existing tree roots and prevent soil compact, any machinery used to remove existing surfaces and ground vegetation for purposes of soft landscaping (e.g. seeding new lawns or laying turf) should be sited outside of RPAs. If this is not possible, hand tools must be used.

6.42. The removal of the surface layer within RPAs must not exceed 50mm, to prevent exposure and damage of tree roots beneath.

6.43. Soft landscaping works must not involve raising or lowering of the existing ground level within any RPA as this can starve roots of oxygen and cause irreversible physiological damage to trees.

6.44. The use of rotavators within RPAs is prohibited.

6.45. Any level changes outside RPAs must be graded to marry existing soil levels within RPAs.

Excavations and Removal of Existing Surfaces

6.46. All excavation must be carried out carefully using spades, forks and trowels, taking care not to damage the bark and wood of any roots. Specialist tools for removing soil around roots using compressed air such as an Air Spade may be an appropriate alternative to hand digging, if available.

6.47. All soil removal must be undertaken with care to minimise the disturbance of roots beyond the immediate area of excavation. Where possible, flexible clumps of small roots, including fibrous roots, should be retained if they can be displaced temporarily or permanently beyond the excavation without damage.

6.48. If digging by hand, a fork should be used to loosen the soil and help locate any substantial roots. Once the roots have been located the trowel should be used to clear the soil away from them without damaging the bark. Exposed roots that are to be removed should be cut cleanly with a sharp saw or secateurs 100-200mm behind the final face of the excavation.

6.49. Roots temporarily exposed must be protected from direct sunlight, drying out and extreme temperatures by appropriate covering. Roots greater than 25mm in diameter should only be cut in exceptional circumstances. Roots greater than 100mm in diameter should only be cut after consultation with the project arboriculturist.

Upgrading Existing Surfaces

6.50. Where upgrading of existing hard surfaces is required, the preferred option will be to leave the surface in place and install the new surface specification on top.

6.51. If the retained surface is impermeable, it may be appropriate to remove or puncture sections to create a more favourable environment for roots beneath, before the new surface is laid, through consultation with the project arboriculturist.

6.52. Where the existing surface is to be removed or upgraded, the surface layer should be excavated down the existing subbase and the new surface specification installed on top, to prevent any damage to roots beneath.

6.53. It is recommended that where possible, new and upgraded hard surfaces should be porous (e.g. permeable brick paving, porous resin bound aggregate or tarmac) to allow the flow or water and oxygen to roots. Wet concrete should only be poured if an impermeable geotextile fabric has first been installed to prevent soil contamination from toxic leachate.

6.54. New surfaces and upgraded surfaces should be set back from the base of stems by a minimum of 50mm to allow space for future growth and minimise the risk of distortion with new surface.

7. ABOUT THE AUTHOR & LIMITATIONS

Authors Qualifications & Experience

7.1. This report has been written by John Morris, Director and Principal Arboricultural Consultant at John Morris Arboricultural Consultancy Ltd. John has a First Class BSc (Hons) in Housing (Ulster University) and a Post Graduate Diploma (UK NQF Level 7) in Arboriculture & Urban Forestry (Myerscough College & University of Central Lancashire). John has worked in the housing, development and arboricultural sectors combined for over 15 years and regularly undertakes continuous professional development (CPD) in all areas of arboriculture and wider business administration. John is a Professional member of the Arboricultural Association (AA), Associate

member of the Institute of Chartered Foresters (ICF) and Chartered member of the Institute of Housing (CIH).

Limitations

7.2. This report is for planning purposes and is not a detailed assessment of the health and condition of trees, however where defects have been identified works have been recommended to ensure site safety.

7.3. This report does not take responsibility for the effects of extreme weather conditions, vandalism, accidents or any works to trees that occur without the authors knowledge, or that are not recommended within this report.

7.4. Tools used during the assessment have been limited to a sounding mallet, probe or binoculars.

7.5. No invasive or diagnostic equipment has been used, nor have any aerial inspections, belowground root investigations, or soil, leaf or root samples been taken for further testing or analysis.

7.6. Trees were assessed during a single visit conducted on 21st November 2019 and the information gathered during the survey pertains to that moment in time.

7.7. The observations within this report will remain valid for two years from the date of inspection.

7.8. The location of trees places reliance on the accuracy of the topographical survey unless otherwise caveated within the report.

7.9. All works recommendation as a result of the survey should be undertaken by a suitably qualified and insured arborist in accordance with BS3998:2020 *Tree Works – Recommendations* to prevent any structural or physiological impairment to trees.

Appendices

Appendix 1: Tree Survey Criteria (BS5837:2012)

The assessment of the trees has been carried out in accordance with the guidance provided in Annexe C of BS5837, which requires that any tree on or influencing distance of the site with a stem diameter of over 75mm at 1.5m above ground level be recorded.

Stem diameter measurements were taken using a girthing tape or Biltmore stick, and in accordance with Annexe D of BS5837.

Height, crown spread, and canopy clearance measurements are recorded in accordance with the measurement convention detailed in paragraph 4.4.2.6 of BS5837.

The trees are categorised in an order defined in **Table 1** of BS5837, a copy of which can be seen below in **Figure 1**, but which can be summarised as:

- **Category A** Trees of high quality and value in such a condition as to be able to make a substantial contribution for a minimum of 40 years.
- **Category B** Trees of moderate quality and value in such a condition as to make a significant contribution for a minimum 20 years.
- **Category C** Trees of low quality and value currently in adequate condition and able to remain until new planting can be established with a minimum useful life expectancy of 10 years, and young trees with a stem diameter less than 150mm.
- **Category U** Trees in poor structural condition or physiological decline that cannot be realistically retained in the context of current land use for more than 10 years.

Further subcategories 1-3 indicate the area(s) in which a tree or group retention value lies.

- Mainly arboricultural.
- Mainly landscape.
- Mainly cultural, including conservation.

Table 1 **Cascade chart for tree quality assessment**

Category and definition	Criteria (including subcategories where appropriate)			Identification on plan
Trees unsuitable for retention (see Note)				
Category U Those in such a condition that they cannot realistically be retained as living trees in the context of the current land use for longer than 10 years	• Trees that have a serious, irremediable, structural defect, such that their early loss is expected due to collapse, including those that will become unviable after removal of other category U trees (e.g. where, for whatever reason, the loss of companion shelter cannot be mitigated by pruning) • Trees that are dead or are showing signs of significant, immediate, and irreversible overall decline • Trees infected with pathogens of significance to the health and/or safety of other trees nearby, or very low quality trees suppressing adjacent trees of better quality *NOTE Category U trees can have existing or potential conservation value which it might be desirable to preserve; see **4.5.7**.*			See Table 2
	1 Mainly arboricultural qualities	**2 Mainly landscape qualities**	**3 Mainly cultural values, including conservation**	
Trees to be considered for retention				
Category A **Trees of high quality** with an estimated remaining life expectancy of at least 40 years	Trees that are particularly good examples of their species, especially if rare or unusual; or those that are essential components of groups or formal or semi-formal arboricultural features (e.g. the dominant and/or principal trees within an avenue)	Trees, groups or woodlands of particular visual importance as arboricultural and/or landscape features	Trees, groups or woodlands of significant conservation, historical, commemorative or other value (e.g. veteran trees or wood-pasture)	See Table 2
Category B **Trees of moderate quality** with an estimated remaining life expectancy of at least 20 years	Trees that might be included in category A, but are downgraded because of impaired condition (e.g. presence of significant though remediable defects, including unsympathetic past management and storm damage), such that they are unlikely to be suitable for retention for beyond 40 years; or trees lacking the special quality necessary to merit the category A designation	Trees present in numbers, usually growing as groups or woodlands, such that they attract a higher collective rating than they might as individuals; or trees occurring as collectives but situated so as to make little visual contribution to the wider locality	Trees with material conservation or other cultural value	See Table 2
Category C **Trees of low quality** with an estimated remaining life expectancy of at least 10 years, or young trees with a stem diameter below 150 mm	Unremarkable trees of very limited merit or such impaired condition that they do not qualify in higher categories	Trees present in groups or woodlands, but without this conferring on them significantly greater collective landscape value; and/or trees offering low or only temporary/transient landscape benefits	Trees with no material conservation or other cultural value	See Table 2

Appendix 2 – Calculation of the Root Protection Area

Circle Radius

The circle radius has been calculated by obtaining the stem diameter (measured at 1.5m above the ground) in millimetres and multiplying it by 12. Where the tree is multi-stemmed, an average stem diameter is calculated by the following formula specified in section 4.6.1 (a) & (b) of BS5837.

For trees with two to five stems, the combined stem diameter should be calculated as follows:

$$\sqrt{(\text{stem diameter 1})^2 + (\text{stem diameter 2})^2 \ldots + (\text{stem diameter 5})^2}$$

For trees with more than five stems (not illustrated in Annex C), the combined stem diameter should be calculated as follows:

$$\sqrt{(\text{mean stem diameter})^2 \times \text{number of stems}}$$

This total is then divided by 1000 to provide a circle radius in metres.

RPA Areas

The RPA has been assessed according to the recommendations set out in section 4.6 of BS5837. It is calculated by multiplying the radius squared by 3.142 (π).

Length of sides of a square

Section 5.5.3 of BS5837 recommends that the ground protection and barriers should be shown as a polygon surrounding the stem of the tree. With a circle, the distance from the edge of the circle to the centre will remain constant, but with a square, the distance from the centre of the tree to the sides of the square is less than the distance to the corner of the square. The area of the square must remain the same as the area of the circle. In order to ensure that it is
the case, the length of side of the square is calculated at the square root of the RPA area.

Minimum barrier distance

This is the closest point that a side of the square can be to the centre of the tree.

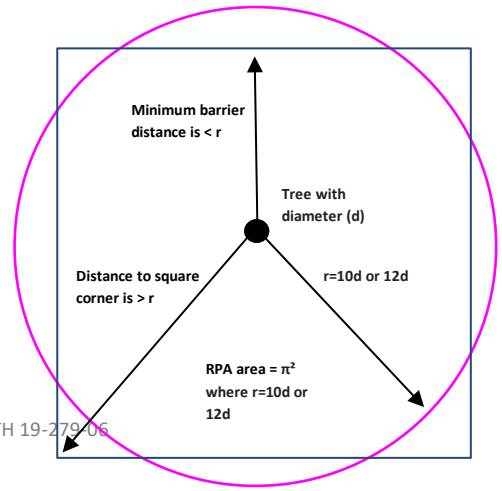


Figure 1. Illustration of area calculations and minimum barrier distances

Figure 1 illustrates the differences between a square and a circle in area. Where the distance from the centre of the tree to the corner of the square is greater than the radius of the circle (r), but the distance from the centre of the tree to the side of the square is greater than the radius of the circle (r), the total area will remain the same. The minimum barrier distance from
the tree is calculated by taking the length of the side and dividing it by two.

Clarification note on the RPA radius

The RPA radius is not the automatic minimum distance of the tree protection. It is a notional figure for use as a means of calculating the actual area of the RPA. BS5837 clarifies this under *Section 3.7 Root Protection Area (RPA) – layout design tool indicating the minimum area around a tree deemed to contain sufficient roots and rooting volume to maintain the trees viability, and where the protection of the roots and soil structure is treated as a priority.*

Appendix 3 – Example of Tree Protective Fencing

heras® 151 and 151steadfast system

round top panel with anti-climb mesh
high visibility orange blocks
steadfast strut
anti-tamper coupler
fully tested and certificated
health and safety compliant (HSG 151)

Having invented the original concept of temporary fencing back in the 80's, Heras is proud of its reputation as a true innovator.

Our latest solution for securing site perimeters and protecting the public has been phenomenally successful since its launch, and offers the ultimate market leading temporary fencing system.

Our safest, most stable and most secure system ever offers you total peace of mind, and unrivaled performance.

You can be sure that by installing the Heras® 151 Steadfast System (patent pending), you are conforming fully to the latest HSE Guidelines on "Protecting the Public" from the dangers of construction sites.

Heras has campaigned widely over recent years against falling product standards, and has consulted closely with senior figures across the construction industry to ensure our products meet and exceed your expectations. This latest innovative system means you should never again need to compromise on:

- Value for money
- Quality
- Performance
- Design
- Ease of installation.

All backed up with unbeatable service from our nationwide branch network – deal direct with Heras – your safety first fencing supplier.

Fully Tested and Certificated

- Extensive independent testing by Sheffield Hallam University has proved the performance of the system, resisting wind speeds well in excess of gale force.
- The HSE has confirmed that the system meets all of the guidelines in the HSG 151 Publication "Protecting the Public - Your next move".
- In turn, therefore, we can offer customers a certificate of compliance when they purchase this system from Heras.
- It is your responsibility to ensure the system is correctly installed and fixed. For help and advice, contact your nearest branch.

151 system

The key components of the Heras 151 system are as listed:

Round Top Panel with Anti-Climb Mesh

- The strongest panel on the market: with 3 sides formed from a continuous length of tube, eliminating the top corner weld, often the weakest point in traditional Panel design.

High Visibility Orange Block

- Permanently coloured with a durable UV stabilised "hi-viz" casing and filled with solid high density concrete.
- Effectively highlights any potential trip hazard.
- Beware of cheap imitations – painted coatings will chip and peel.

Heraslock® Anti-Tamper Coupler

- Providing additional security, these couplers can only be removed with the use of the specialist tool.

151 steadfast system

The Heras 151 steadfast system incorporates all the benefits of the 151 system, with the addition of the patented...

Heras® Steadfast Strut

- The unique design of this clever strut dramatically increases the stability of the fence.
- The strut fits neatly within the high visibility block allowing a neat and compact solution, and acts as an integrated anti-lift device.
- 3 additional fixing holes incorporated into the design allow for soil pins and thunderbolts, dependent on ground conditions.

Optional Extras

- Heras® Steadfast Safety Strips with reflective coating can be fitted in minutes to highlight site dangers.
- Front support brackets allow vastly improved performance on softer ground conditions and fit quickly and easily into the high visibility blocks.

ROUND TOP PANELS WITH ANTI-CLIMB MESH

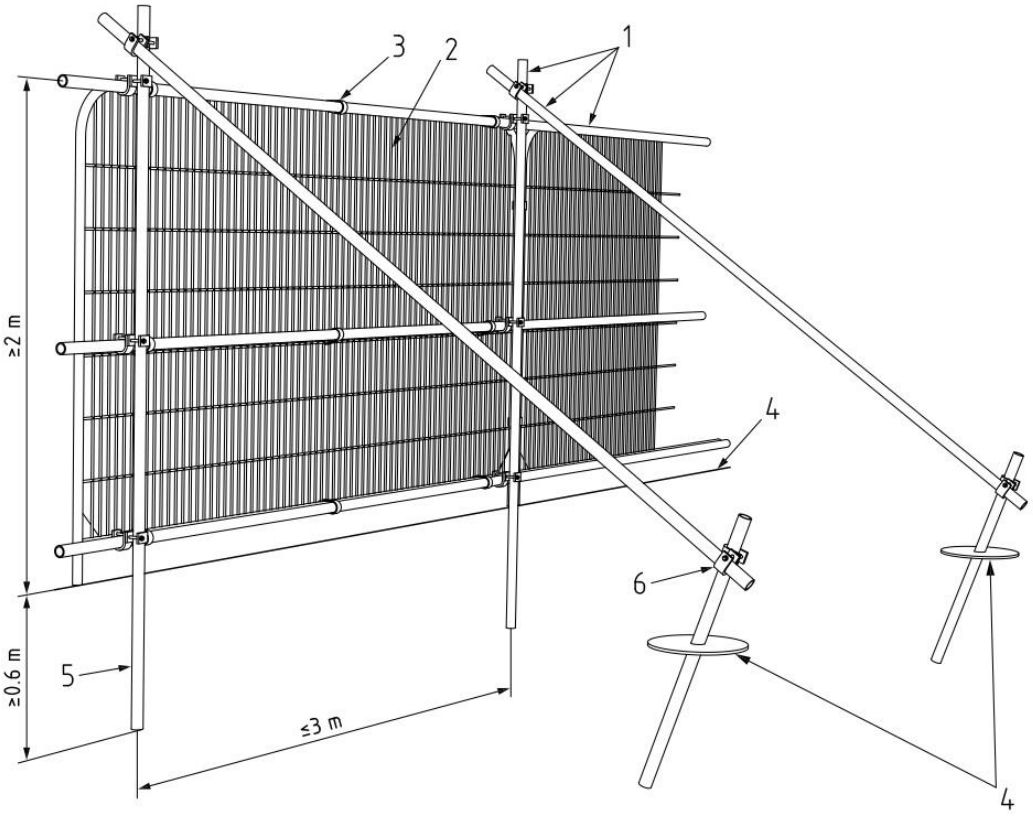
1. Front stabiliser
2. High visibility footblocks
3. Round top panel
4. Steadfast strut.
5. Anti-tamper coupler
6. Optional steadfast safety strips
7. Anti-climb round top panel with steadfast struts to increase stability

Our latest solution for securing site perimeters and protecting the public has been phenomenally successful since its launch, and offers the ultimate market leading temporary fencing system.

2 Heras | The Original Name for Temporary Fencing
www.herasreadyfence.co.uk

Heras | The Original Name for Temporary Fencing 3
Telephone: 0844 472 0011

Figure 2 **Default specification for protective barrier**



Key

1 Standard scaffold poles
2 Heavy gauge 2 m tall galvanized tube and welded mesh infill panels
3 Panels secured to uprights and cross-members with wire ties
4 Ground level
5 Uprights driven into the ground until secure (minimum depth 0.6 m)
6 Standard scaffold clamps

Appendix 4 – Example of Tree Protective Signs

Appendix 5 – Example of Temporary Ground Protection

DuraDeck

PRODUCT SPECIFICATIONS
DD1

Traction Surface: **Double-traction tread design includes two parallel traction treads positioned at 90 degrees to adjacent double traction tread sets.**

Module Size:
Length: 8' / 2.44 m
Width: 4' / 1.22 m
Module Size: 32 sq/ft / 2.973 sq/meters
Thickness: ½" thick mat + 3/8" cleat

Module Weight: 86 lbs. / 39.01 kg.
Per Square Foot: 2.69 lbs. / 43 oz. / 1.22 kg. / 1219 grams
Per Square Meter: 28.60 lbs. / 12.97 kg.

Colors: Black, White.
Custom colors available (minimum order required).

Material: Black High-Density Polyethylene (HDPE) post-industrial recycled plastic, naturally UV resistant due to the carbon black used for color. White mats available.

Test Results:

	ASTM	Units	Typical Values
Melt Index	D 1238	g/10min	4.9
Density	D 792	g/cm^3	.960
Tensile Strength @ Yield 50mm/min	D 638	mpa (psi)	30 (4,350)
Elongation @ Break 50mm/min	D 638	%	1 500
Flexural Modulus	D 790	mpa (psi)	1 240 (180,000)
Hardness, Shore D	D 2240	--	70
Compressive Strength:		D695-02a	psi 2,843
Flammability Resistance:	UL-94 HB		Passed

Tread Pattern: **DD1:** Rugged double-traction tread on both sides

Support Structure: Matting incorporates multi-directional structural support (cleat design) allowing for distribution or dispersion of PSI weight factors. Not intended for bridging.

Weight Loading: Varies, depending on sub-surface, up to 80 tons capacity.

Ground Surface: DuraDeck mats are designed to be used with no ground preparation over grass, gravel, soil, concrete, asphalt, mud and sandy soil conditions.

Connection System: DuraDeck mats have eight holes: one in each corner and four in the center line (two on each 8ft side) to create multi-directional roadways of nearly any size or shape. Mats can be connected using metal DuraLink connectors. DuraLinks do not require tools to install.

Shipping: Pallet maximum is 50 units (4' x 8')
20' Ocean Container: 250 – 4' x 8' unit order and/or equal to 29,240 lbs.
40' Ocean Container: 500 – 4' x 8' unit order and/or equal to 43,000 lbs.

Warranty: 7 years against cracking and breaking under normal use.

Client	GLL PRS Holdco Limited	**Reference**	19-279-01
Project	Site at Howth Castle	**Survey Date**	21.11.19

Abreviation	**Definition**	**Age Class**		**Physiological Condition**		**Structural Condition**		**Category**		**U.L.E**	**Sub category**	
H	Height (m)	Y (Young)	Newly planted <10 years	Good	No obvious health problems	Good	No visible defects	A	High value and conservation	40+	1	Mainly arboricultural
Stem Dia.	Stem diameter (mm)	SM (Semi-mature)	First third of life expectancy	Fair	Intervention may improve health	Fair	Defects may require intervention	B	Moderate value and conservation	20+	2	Mainly landscape
C.c	Crown clearance (m)	EM (Early mature)	Stage before maturity	Poor	Serious ill health or dying	Poor	Dangerous or no remedy	C	Low value and conservation	10+	3	Mainly cultural
L.b.h	Lowest branch height (m)	M (Mature)	Full age for species					U	Not suitable for retention	<10		
L.b.d	Direction of lowest branch	OM (Over Mature)	Beyond life expectancy & in decline									
U.l.e	Useful life expectancy (yrs)	V/A (Veteran/Ancient)*	Ancient or high conservation value	*(Veteran/Ancient RPA afforded 15x stem diameter in accordance with industry best practice)				*P - Tree on private land*	*G - Group*	*H - Hedge*	**Tree is not on topographical survey and postion remains indicativ*	

Tree No.	Tag No.	Species	Botanical Name	H (m)	Stem Dia.	No of Stems	Crown Spread (m)				C.C (m)	L.B.H (m)	L.B.D	Age	Physiological	Structural	Comments	Recommendatons	U.L.E	Cat.	RPA (m2)	RPA Radial distance (m)
							N	E	S	W												
1	1	Rowan	*Sorbus aucuparia*	9	290	1	3	3	3	3	1	1	East	M	Fair	Fair	Single stem, symetric canopy from 2m, located in far north west corner of site.	Fell to facilitate development proposal.	10+	C1	41	4
2	N/a	Rowan	*Sorbus aucuparia*	7	190	1	2	2	3	2	2	4	West	EM	Fair	Fair	Single stem, growing in grass roadside verge, overhead cables (ohc), offsite.	Fell to facilitate development proposal.	10+	C1	18	2
3	N/a	Norway Maple	*Acer platanoides*	9	290	1	3	2	3	4	3	3	South	EM	Fair	Fair	Single stem, symetric canopy, offsite in roadside verge, ohc.	None.	20+	B1	41	4
4	4	Rowan	*Sorbus aucuparia*	7	230	3	2	2	4	4	3	0	South	M	Fair	Poor	Multistem from ground, growing from base of boundary wall, dense ivy into canopy, likely to damage wall, unsuitable for retention.	Fell and replace as good arboricultural practice.	<10	U	23	3
5	N/a	Sycamore	*Acer pseudoplatanus*	12	566	2	7	7	6	7	0	3	North	M	Fair	Poor	Multistem from ground, growing from base of boundary wall, canopy extends over site by 4m, likely to damage wall, unsuitable for retention.	Fell and replace as good arboricultural practice.	<10	U	150	7
6	N/a	Norway Maple	*Acer platanoides*	11	220	1	2	1	1	4	5	5	West	EM	Fair	Fair	Single stem, supressed canopy, offsite in grass roadside verge (6-9 form clustered group with merged canopies), ohc to immediate north.	None.	10+	C1	23	3
7	N/a	Rowan	*Sorbus aucuparia*	9	270	1	4	2	2	3	5	5	South	M	Fair	Fair	Single stem, asymetric crown, offsite in grass roadside verge.	None.	10+	C1	34	3
8	N/a	Rowan	*Sorbus aucuparia*	9	290	1	5	5	2	2	4	3	North	M	Fair	Fair	Single stem, asymetric crown, offsite in grass roadside verge.	None.	10+	C1	41	4
9	N/a	Norway Maple	*Acer platanoides*	11	270	1	5	5	2	2	6	3	East	EM	Fair	Fair	Single stem, two leaders from 3m, supressed canopy south, minor deadwood <100mm south, offsite in grass roadside verge.	None.	10+	C1	34	3
10	N/a	Norway Maple	*Acer platanoides*	11	270	1	1	1	4	5	5	4	South	EM	Fair	Fair	Single stem, asymetric crown, offsite in grass roadside verge by road, ohc.	None.	10+	C1	34	3
11	N/a	Norway Maple	*Acer platanoides*	10	250	1	5	2	3	5	4	2	South	EM	Fair	Fair	Single stem, asymetric crown, offsite in grass roadside verge, ohc.	None.	10+	C1	28	3
12	N/a	Norway Maple	*Acer platanoides*	8	150	1	5	0	0	4	2	5	North	EM	Fair	Fair	Single leaning stem, offsite in grass roadside verge, ohc.	None.	10+	C1	10	2
13	N/a	Rowan	*Sorbus aucuparia*	9	250	1	4	4	2	3	3	5	North	M	Fair	Fair	Single stem, asymetric crown, offsite in grass roadside verge, ohc.	None.	10+	C1	28	3
14	N/a	Rowan	*Sorbus aucuparia*	10	280	1	3	4	2	3	6	4	East	M	Fair	Fair	Single stem, asymetric crown, offsite in grass roadside verge, ohc.	None.	10+	C1	34	3
15	N/a	Norway Maple	*Acer platanoides*	12	290	1	3	5	5	3	6	4	West	EM	Fair	Fair	Single stem, asymetric crown, offsite in grass roadside verge, ohc.	None.	10+	C1	41	4
16	N/a	Norway Maple	*Acer platanoides*	11	270	1	4	6	5	0	6	4	East	EM	Fair	Fair	Single leaning stem, offsite in grass roadside verge, ohc.	None.	10+	C1	34	3
17	17	Rowan	*Sorbus aucuparia*	10	200	3	3	3	4	4	0	0	South	M	Fair	Poor	Multistem from ground, growing from base of boundary wall, dense ivy into canopy, likely to damage wall, unsuitable for retention.	Fell and replace as good arboricultural practice.	<10	U	32	3
18	18	Sycamore	*Acer pseudoplatanus*	12	650	1	6	6	4	8	3	3	East	M	Fair	Fair	Single ivy clad stem, spreading crown from 3m, canopy extends over wall by 4m.*	None.	20+	B1	191	8
19	19	Sycamore	*Acer pseudoplatanus*	14	660	1	6	3	5	9	2	2	West	M	Fair	Fair	Single dense ivy clad stem, 3 leaders from 2m, damage to lowest limb over wall west, deadwood <100mm in lower canopy, ohc.*	None.	20+	B1	191	8
20	20	Sycamore	*Acer pseudoplatanus*	14	430	1	5	2	1	2	0	4	North	M	Fair	Poor	Single dense ivy clad stem, asymmetric canopy, supressed north, deadwood <100mm in lower canopy.*	None.	10+	C1	82	5

Abreviation	Definition	Age Class		Physiological Condition		Structural Condition		Category			U.L.E	Sub category	
H	Height (m)	Y (Young)	Newly planted <10 years	Good	No obvious health problems	Good	No visible defects	A	High value and conservation		40+	1	Mainly arboricultural
Stem Dia.	Stem diameter (mm)	SM (Semi-mature)	First third of life expectancy	Fair	Intervention may improve health	Fair	Defects may require intervention	B	Moderate value and conservation		20+	2	Mainly landscape
C.c	Crown clearance (m)	EM (Early mature)	Stage before maturity	Poor	Serious ill health or dying	Poor	Dangerous or no remedy	C	Low value and conservation		10+	3	Mainly cultural
L.b.h	Lowest branch height (m)	M (Mature)	Full age for species					U	Not suitable for retention		<10		
L.b.d	Direction of lowest branch	OM (Over Mature)	Beyond life expectancy & in decline										
U.l.e	Useful life expectancy (yrs)	V/A (Veteran/Ancient)*	Ancient or high conservation value	*(Veteran/Ancient RPA afforded 15x stem diameter in accordance with industry best practice)				*P - Tree on private land*	*G - Group*	*H - Hedge*	*Tree is not on topographical survey and postion remains indicativ		

Tree No.	Tag No.	Species	Botanical Name	H (m)	Stem Dia.	No of Stems	Crown Spread (m)				C.C (m)	L.B.H (m)	L.B.D	Age	Physiological	Structural	Comments	Recommendatons	U.L.E	Cat.	RPA (m2)	RPA Radial distance (m)
							N	E	S	W												
21	21	Beech (Common)	*Fagus sylvatica*	16	720	1	6	8	6	6	5	5	South	M	Fair	Fair	Twin stem, forks at 4m, union occluded, deadwood <100mm south, prominent tree in local landscape.	None.	20+	B1	238	9
22	22	Sycamore	*Acer pseudoplatanus*	15	520	1	7	3	4	9	3	4	West	M	Fair	Fair	Single dense ivy clad stem, deadwood <100mm in lower crown, 5m from wall, merged canopy with 23.*	None.	20+	B1	125	6
23	23	Beech (Common)	*Fagus sylvatica*	18	1020	1	7	12	8	8	4	4	South	M	Fair	Poor	Single stem, forks at 5m with crack in limb east over entrance road, prominent tree in local landscape.	Reduce crown by 4m and remove deadwood >100mm.	20+	B1	475	12
24	24	Ash (Common)	*Fraxinus excelsior*	19	560	1	2	3	3	5	1	2	West	M	Fair	Poor	Single dense ivy clad stem, limb extending over wall west, deadwood <100mm in canopy, unsuitable for retention without shelter of neighbouring trees.	None.	10+	C1	137	7
25	25	Sycamore	*Acer pseudoplatanus*	16	580	1	5	2	2	8	0	1	West	M	Fair	Poor	Single dense ivy clad stem, limb arising at 0.5m from main stem leaning west over wall, asymetric canopy with growth west over site.	Remove limb arising at 0.5m off main stem west over site.	10+	C1	150	7
26	26	Sycamore	*Acer pseudoplatanus*	16	490	1	2	2	3	8	1	2	West	M	Fair	Poor	Single leaning ivy clad stem, limbs extending over wall, deadwood <100mm in lower ccrown, ohc.	None.	10+	C1	113	6
27	27	Sycamore	*Acer pseudoplatanus*	15	460	1	4	1	1	7	1	4	West	M	Fair	Poor	Single ivy clad stem leaning west over wall, dense epicormic growth at base indicating physiological stress, canopy growth supressed west over site forming asymmetric canopy, deadwood <100mm in lower crown.	None.	10+	C1	92	5
28	28	Sycamore	*Acer pseudoplatanus*	15	480	1	0	2	7	7	1	2	West	M	Fair	Poor	Single leaning ivy clad stem, two leaders from 3m, deadwood <100mm in lower crown.	Prune limbs over wall.	10+	C1	102	6
G29	29	Mixed Species (Group)	*N/a*	10	180	1	4	4	4	4	0	N/a	East	EM	Fair	Poor	Understorey group of sycamore, beech, ash, elder and laurel, multistem from ground, low retention value but provides dense screening to site from road entrance.	None.	10+	C2	14	2
30	30	Beech (Common)	*Fagus sylvatica*	22	810	1	9	10	9	9	2	4	East	M	Fair	Fair	Single ivy clad stem, tallest specimin in boundary group, spreading symetric canopy, 6.5m from wall.*	Remove deadwood >100mm within canopy.	20+	B1	290	10
31	31	Beech (Common)	*Fagus sylvatica*	20	450	1	3	6	3	5	6	8	South	M	Poor	Fair	Single stem, shaded out by 30 forming asymmetric canopy, dieback in upper crown.	None.	10+	C1	92	5
32	32	Holly	*Ilex sp.*	9	308	2	3	5	3	3	0	0	East	M	Fair	Fair	More prominent tree within understorey group to extreme east of by entrance road.	None.	10+	C1	41	4
33	33	Sycamore	*Acer pseudoplatanus*	14	410	1	2	5	4	3	0	3	West	M	Fair	Poor	Single dense ivy clad stem, deadwood <100mm in lower canopy, merged canopy with 34.	None.	10+	C1	72	5
34	34	Sycamore	*Acer pseudoplatanus*	14	620	1	6	3	7	7	0	2	South	M	Fair	Poor	Single dense ivy clad stem, two leaders from 2m, supressed canopy with growth west over wall, deadwood <100mm in lower canopy.	None.	10+	C1	177	8
35	35	Sycamore	*Acer pseudoplatanus*	19	760	1	7	10	4	5	7	8	East	M	Fair	Fair	Single ivy clad stem, canopy extends east towards centre of entrance road, prominent tree within local landscape.	None.	20+	B1	254	9
36	36	Bay	*Laurus nobilis*	12	350	2	4	4	5	5	9	4	West	M	Fair	Poor	Two stems, forked union at base, limbs extending towards wall west.	None.	10+	C1	55	4

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H	Height (m)	Y (Young)	Newly planted <10 years	Good	No obvious health problems	Good	No visible defects	A	High value and conservation	40+	1	Mainly arboricultural
Stem Dia.	Stem diameter (mm)	SM (Semi-mature)	First third of life expectancy	Fair	Intervention may improve health	Fair	Defects may require intervention	B	Moderate value and conservation	20+	2	Mainly landscape
C.c	Crown clearance (m)	EM (Early mature)	Stage before maturity	Poor	Serious ill health or dying	Poor	Dangerous or no remedy	C	Low value and conservation	10+	3	Mainly cultural
L.b.h	Lowest branch height (m)	M (Mature)	Full age for species					U	Not suitable for retention	<10		
L.b.d	Direction of lowest branch	OM (Over Mature)	Beyond life expectancy & in decline									
U.l.e	Useful life expectancy (yrs)	V/A (Veteran/Ancient)*	Ancient or high conservation value	*(Veteran/Ancient RPA afforded 15x stem diameter in accordance with industry best practice)				*P - Tree on private land*	*G - Group*	*H - Hedge*	*Tree is not on topographical survey and postion remains indicativ*	

Tree No.	Tag No.	Species	Botanical Name	H (m)	Stem Dia.	No of Stems	Crown Spread (m)				C.C (m)	L.B.H (m)	L.B.D	Age	Physiological	Structural	Comments	Recommendatons	U.L.E	Cat.	RPA (m2)	RPA Radial distance (m)
							N	E	S	W												
37	37	Beech (Common)	*Fagus sylvatica*	21	700	1	8	11	7	10	10	10	South	M	Fair	Fair	Single ivy clad stem, symetric canopy, prominent in local landscape.*	None.	20+	B1	222	8
38	38	Beech (Common)	*Fagus sylvatica*	21	810	1	7	10	8	8	3	10	East	M	Fair	Fair	Single stem, ganoderma australe at base east, prominent tree with symetric canopy.*	Reduce crown by 3-4m.	20+	B1	290	10
39	39	Sycamore	*Acer pseudoplatanus*	15	390	1	6	2	2	6	0	4	West	EM	Fair	Poor	Single leaning stem with ivy into canopy, heavily supressed canopy with growth over wall west, heavy epicormic growth at base.*	None.	10+	C1	72	5
40	40	Beech (Common)	*Fagus sylvatica*	22	860	1	7	7	8	8	8	10	West	M	Fair	Fair	Single ivy clad stem, symetric crown, prominent tree in local landscape.	None.	20+	B1	327	10
41	41	Elm	*Ulmus sp.*	7	144	2	2	1	2	8	1	1	West	SM	Fair	Poor	Twin stem, ivy clad into crown, heavily supressed canopy with growth over wall west, low retention value.	Allow to naturally decline in woodland location.	<10	U	10	2
42	42	Elm	*Ulmus sp.*	8	220	1	2	1	2	5	1	1	West	SM	Fair	Poor	Twin stem, ivy clad into crown, heavily supressed canopy over with growth over wall west, low retention value.	Allow to naturally decline in woodland location.	<10	U	23	3
43	43	Sycamore	*Acer pseudoplatanus*	10	360	1	5	1	2	7	1	3	West	EM	Fair	Poor	Single stem, ivy clad into canopy, heavily supressed canopy with growth west over wall, limited retention value.	None.	10+	C1	55	4
44	44	Lime (Common)	*Tilia x europaea*	7	344	4	4	4	4	4	0	0	West	EM	Fair	Poor	Multistem growing west over wall, low retention value.	Allow to naturally decline in woodland location.	<10	U	55	4
45	45	Beech (Common)	*Fagus sylvatica*	21	620	1	5	5	6	6	2	4	South	M	Fair	Poor	Single stem, heavily supressed canopy, leaning south, deadwood <100mm in lower canopy.	None.	10+	C1	177	8
46	46	Lime (Common)	*Tilia x europaea*	16	410	1	5	4	2	6	0	0	West	M	Poor	Poor	Single ivy clad stem, heavy epicormic growth at base, supressed canopy with growth west over wall, has previously been pruned to boundary wall.	None.	10+	C1	72	5
47	47	Beech (Common)	*Fagus sylvatica*	18	750	1	4	6	7	9	0	6	South	M	Fair	Fair	Single ivy clad stem, epicormic growth at base, dense canopy but partially supressed north.*	None.	20+	B1	254	9
48	48	Sycamore	*Acer pseudoplatanus*	20	810	1	7	8	8	6	10	8	South	M	Fair	Fair	Single ivy clad stem, two leaders with forked occluded union at 7m, prominent tree in local landscape.*	None.	20+	B1	290	10
49	49	Lime (Common)	*Tilia x europaea*	18	510	1	4	6	4	6	0	0	South	M	Fair	Poor	Single ivy clad stem, epicormic growth, supressed canopy*.	None.	10+	C1	113	6
50	50	Sycamore	*Acer pseudoplatanus*	18	800	1	4	8	9	7	0	0	West	M	Fair	Poor	Multistem from base, limbs extending south east and south west, deadwood >100mm throughout canopy, barb wire running through base of stem west, hollow in main stem west at 8m.	None.	10+	C1	290	10
G51	51	Mixed Species (Group)	*N/a*	12	180	1	3	3	3	3	0	0	East	EM	Fair	Fair	Mixed species group, contains laurel, holly, kohu, sycamore, elm and beech, canopies merged, provides good screening along entrance road, retain as woodland feature, extends south further offsite along entrance road.	None.	20+	B2	14	2
52	52	Sycamore	*Acer pseudoplatanus*	14	370	1	3	2	2	6	2	2	West	EM	Fair	Fair	Single stem at edge of woodland feature, ivy clad into canopy, two leaders from 3m, deadwood in lower crown <100mm.*	None.	20+	B1	64	5

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Stem Dia.	Stem diameter (mm)	SM (Semi-mature)	First third of life expectancy	Fair	Intervention may improve health	Fair	Defects may require intervention	B	Moderate value and conservation	20+	2	Mainly landscape
C.c	Crown clearance (m)	EM (Early mature)	Stage before maturity	Poor	Serious ill health or dying	Poor	Dangerous or no remedy	C	Low value and conservation	10+	3	Mainly cultural
L.b.h	Lowest branch height (m)	M (Mature)	Full age for species					U	Not suitable for retention	<10		
L.b.d	Direction of lowest branch	OM (Over Mature)	Beyond life expectancy & in decline									
U.l.e	Useful life expectancy (yrs)	V/A (Veteran/Ancient)*	Ancient or high conservation value	*(Veteran/Ancient RPA afforded 15x stem diameter in accordance with industry best practice)				*P - Tree on private land*	*G - Group*	*H - Hedge*	*Tree is not on topographical survey and postion remains indicativ	

Tree No.	Tag No.	Species	Botanical Name	H (m)	Stem Dia.	No of Stems	Crown Spread (m)				C.C (m)	L.B.H (m)	L.B.D	Age	Physiological	Structural	Comments	Recommendatons	U.L.E	Cat.	RPA (m2)	RPA Radial distance (m)
							N	E	S	W												
53	53	Elm	*Ulmus sp.*	16	351	5	4	4	3	6	0	0	West	EM	Fair	Poor	Multistem from base, ivy clad, deadwood <100mm in lower canopy.*	None.	10+	C1	55	4
54	54	Sycamore	*Acer pseudoplatanus*	15	558	2	5	5	6	6	0	0	West	M	Fair	Fair	Multistem from base, ivy clad into canopy, fairly symetric canopy given location at edge of woodland feature*.	None.	10+	C1	137	7
55	55	Sycamore	*Acer pseudoplatanus*	16	391	3	5	7	6	6	0	0	West	M	Fair	Fair	Multistem from base, ivy clad into canopy, last tree in group located at south west corner by boundary wall, ohc.	None.	10+	C1	72	5
56	N/a	Field maple	*Acer campestre*	13	350	1	7	7	4	3	2	4	East	M	Fair	Fair	Single stem, two leaders from 2m, supressed canopy east, (56-58 form group), offsite.*	None.	20+	B1	55	4
57	N/a	Field maple	*Acer campestre*	14	410	1	8	6	4	5	1	2	North	M	Fair	Fair	Single stem, two leaders from 3m, asymetric canopy with supressed growth north, offsite.*	None.	20+	B1	72	5
58	N/a	Field maple	*Acer campestre*	13	370	1	4	8	4	6	6	3	East	M	Fair	Fair	Single stem, two leaders from 3m, reasonably symetric canopy, offsite.*	None.	20+	B1	64	5
59	N/a	Sikta spruce	*Picea sitchensis*	16	410	1	5	3	4	3	4	6	East	M	Fair	Fair	Single stem, supressed canopy east, reasonable example of species, offsite.*	None.	20+	B1	72	5
60	N/a	Sikta spruce	*Picea sitchensis*	16	350	1	4	3	3	4	3	5	West	M	Fair	Fair	Single stem, forms merged canopy with 59.*	None.	20+	B1	55	4
61	N/a	Sycamore	*Acer pseudoplatanus*	16	570	1	6	9	6	7	3	4	West	M	Fair	Fair	Single stem, spreading symetric crown, reasonable example of species, offsite.*	None.	20+	B1	150	7
62	N/a	Sycamore	*Acer pseudoplatanus*	17	500	1	5	4	3	4	2	3	North	M	Fair	Fair	Single stem, symetric cpreading crown, good example of species, offsite.*	None.	20+	B1	113	6
63	N/a	Sycamore	*Acer pseudoplatanus*	17	560	1	5	6	5	6	3	2	West	M	Fair	Fair	Single stem, symetric cpreading crown, good example of species, offsite.*	None.	20+	B1	137	7
G64	64-88	Beech (Group)	*Fagus sylvatica*	8	150	1	3	2	2	2	2	2	East	Y	Fair	Fair	Dense group of 20 located off fairway, multiple forked stems, signs of beech bark disease within group, low quality with limited retention value.	None.	10+	C2	10	2
G65	89-99	Hawthorwn (Group)	*Crataegus monogna*	8	277	2	2	2	3	3	1	0	East	M	Fair	Poor	Linear group of 11 dividing 64 & 66, multistem from from base, wire around stems, dense ivy into canopy, most southern tree tagged only.	None.	10+	C2	34	3
G66	100-117	Beech (Group)	*Fagus sylvatica*	8	180	2	2	2	2	2	0	1	East	SM	Fair	Fair	Clustered group of 18 located off fairway, low value group with limited retention value, most eastern tree tagged only.	None.	10+	C2	14	2
H67	118	Hawthorn	*Crataegus monogna*	8	200	1	3	3	3	6	0	0	North	M	Fair	Poor	Hedgerow extending north west from northern edge of centrally located group that divides golf course from field, dense brambles and ivy throughout with multiple gaps, low quality, central tree at gap in hedge tagged.	Part removal to facilitate development proposal. Remainder to be enhanced with new supplementary planting and maintenance.	<10	U	18	2
68	N/a	Sycamore	*Acer pseudoplatanus*	14	340	1	5	5	4	4	2	4	East	EM	Fair	Fair	Single stem growing from hedgerow along western edge of site boundary, canopy supressed with growth concentrated over neighbouring property garden.	Fell to facilitate development proposal.	20+	B1	55	4
H69	N/a	Leland cypress	*Cupressus Leylandii*	3	150	1	2	2	2	2	0	0	N/a	SM	Poor	Poor	Offsite hedgerow growing along neighbouring property garden boundary.	Prune to site boundary line.	10+	C2	10	2
H70	N/a	Mixed species	*N/a*	4	140	1	2	2	2	2	0	0	N/a	EM	Fair	Poor	Offsite hedgerow along neighbouring property boundary, contains privet and hawthorn, dense brambles extend from hedge onto site.	Clear undergrowth and prune hedge to site boundary line.	10+	C2	10	2

Abreviation	Definition	Age Class		Physiological Condition		Structural Condition		Category		U.L.E	Sub category	
H	Height (m)	Y (Young)	Newly planted <10 years	Good	No obvious health problems	Good	No visible defects	A	High value and conservation	40+	1	Mainly arboricultural
Stem Dia.	Stem diameter (mm)	SM (Semi-mature)	First third of life expectancy	Fair	Intervention may improve health	Fair	Defects may require intervention	B	Moderate value and conservation	20+	2	Mainly landscape
C.c	Crown clearance (m)	EM (Early mature)	Stage before maturity	Poor	Serious ill health or dying	Poor	Dangerous or no remedy	C	Low value and conservation	10+	3	Mainly cultural
L.b.h	Lowest branch height (m)	M (Mature)	Full age for species					U	Not suitable for retention	<10		
L.b.d	Direction of lowest branch	OM (Over Mature)	Beyond life expectancy & in decline									
U.l.e	Useful life expectancy (yrs)	V/A (Veteran/Ancient)*	Ancient or high conservation value	*(Veteran/Ancient RPA afforded 15x stem diameter in accordance with industry best practice)				*P - Tree on private land*	*G - Group*	*H - Hedge*	*Tree is not on topographical survey and postion remains indicativ*	

Tree No.	Tag No.	Species	Botanical Name	H (m)	Stem Dia.	No of Stems	Crown Spread (m)				C.C (m)	L.B.H (m)	L.B.D	Age	Physiological	Structural	Comments	Recommendatons	U.L.E	Cat.	RPA (m2)	RPA Radial distance (m)
							N	E	S	W												
71	122	Scots Pine	*Pinus sylvestris*	14	140	1	5	2	2	2	3	2	North	SM	Fair	Fair	Forms linear group of 4 (71-74) extending from gap in central group dividing golf course and offsite field to west, asymmetric canopies growing north, stem damage west.	None.	10+	C1	10	2
72	N/a	Scots Pine	*Pinus sylvestris*	8	160	1	2	2	2	2	3	2	N/a	SM	Fair	Fair	Single stem, dense understorey of brambles, asymetric canopy growing north.	None.	10+	C1	10	2
73	N/a	Scots Pine	*Pinus sylvestris*	10	160	1	2	2	2	2	3	2	North	SM	Fair	Poor	Single stem, dense understorey of brambles, asymetric canopy growing north.	None.	10+	C1	10	2
74	N/a	Scots Pine	*Pinus sylvestris*	12	210	1	4	2	2	2	3	2	North	EM	Fair	Poor	Single stem, dense understorey of brambles, asymetric canopy growing north.	None.	10+	C1	18	2
75	N/a	Scots Pine	*Pinus sylvestris*	13	200	1	4	3	2	3	4	2	North	EM	Fair	Poor	Single stem, west side of H67, dense understorey of brambles.	None.	10+	C1	18	2
G76	127-138	Birch (Group)	*Betula*	16	240	1	6	2	2	2	2	2	North	EM	Fair	Poor	Linear group of 12 extending from gap in group that divides golf course from offsite field east to H67, limited space for future growth and development, limited retention value.	None.	10+	C1	28	3
G77	139-149	Scots Pine (Group)	*Pinus sylvestris*	14	180	1	3	2	2	2	2	2	North	SM	Fair	Poor	Linear group of 11 extending from gap in central group that divides golf course from field to H67, located centrally within group dividing golf course from field.	None.	20+	B1	14	2
78	150	Larch	*Larix sp.*	14	170	1	2	3	4	3	1	1	South	SM	Fair	Poor	Single stem located to far west of central group dividing golf course and field.	None.	10+	C1	14	2
G79	151	Oak (Group)	*Quercus robur*	12	160	0	2	2	3	2	0	1	South	SM	Fair	Fair	Linear clustered understorey group of 6 extending from gap in central group dividing golf course and field, most westerly tree in group tagged.	None.	10+	C2	10	2
80	152	Poplar	*Populus spp.*	15	160	0	2	2	2	2	4	2	South	SM	Fair	Poor	Single stem, forms linear group of 4 (80-83).	None.	10+	C1	10	2
81	N/a	Poplar	*Populus spp.*	18	200	0	1	1	1	1	3	2	South	SM	Fair	Fair	Better quality tree withing group of 4.	None.	20+	B1	18	2
82	N/a	Poplar	*Populus spp.*	15	120	0	1	1	1	1	4	2	South	SM	Fair	Poor	No space for future growth, growing in close proximity to 81 & 83.	None.	10+	C1	7	2
83	N/a	Poplar	*Populus spp.*	18	220	0	2	2	2	2	4	2	South	SM	Fair	Fair	Better quality tree withing group of 4.	None.	20+	B1	23	3
84	156	Alder	*Alnus spp.*	12	310	1	4	4	5	4	2	2	South	EM	Fair	Fair	Single stem, two leaders from 2m, stem damage west.	None.	20+	B1	41	4
85	N/a	Alder	*Alnus spp.*	10	160	0	2	3	4	5	2	2	South	SM	Fair	Poor	Single stem, heavily supressed canopy growing in close proximity to 86 with no space for future growth.	None.	10+	C1	10	2
86	N/a	Alder	*Alnus spp.*	10	180	0	2	3	4	2	1	1	South	SM	Fair	Poor	Single stem heavily supressed canopy, in close proximity to 85 with no space for future growth.	None.	10+	C1	14	2
87	N/a	Alder	*Alnus spp.*	10	240	0	2	3	4	3	1	1	South	EM	Fair	Poor	Single stem spreading canopy.	None.	20+	B1	28	3
88	N/a	Alder	*Alnus spp.*	14	260	0	3	3	4	3	1	1	South	EM	Fair	Fair	Single stem spreading canopy.	None.	20+	B1	28	3
89	161	Alder	*Alnus spp.*	14	290	0	4	4	4	4	1	1	South	EM	Fair	Fair	Single stem spreading canopy.	None.	20+	B1	41	4
90	162	Alder	*Alnus spp.*	13	300	1	3	4	4	4	2	2	South	EM	Fair	Fair	Single ivy clad stem, dense undergrowth, symetric canopy.	None.	10+	C1	41	4
91	163	Hawthorn (Common)	*Crataegus monogyna*	10	480	1	3	3	4	4	2	3	West	OM	Fair	Fair	Single stem, south of central group by 4m, symetric canopy.	None.	10+	C1	102	6
92	164	Alder	*Alnus spp.*	15	290	1	4	3	3	4	0	2	South	EM	Fair	Fair	Single stem spreading canopy.	None.	20+	B1	41	4
93	165	Scots Pine	*Pinus sylvestris*	14	160	1	2	2	2	2	4	4	East	SM	Fair	Fair	Single stem with supressed canopy.	None.	10+	C1	10	2

Abreviation	Definition	Age Class		Physiological Condition		Structural Condition		Category		U.L.E	Sub category	
H	Height (m)	Y (Young)	Newly planted <10 years	Good	No obvious health problems	Good	No visible defects	A	High value and conservation	40+	1	Mainly arboricultural
Stem Dia.	Stem diameter (mm)	SM (Semi-mature)	First third of life expectancy	Fair	Intervention may improve health	Fair	Defects may require intervention	B	Moderate value and conservation	20+	2	Mainly landscape
C.c	Crown clearance (m)	EM (Early mature)	Stage before maturity	Poor	Serious ill health or dying	Poor	Dangerous or no remedy	C	Low value and conservation	10+	3	Mainly cultural
L.b.h	Lowest branch height (m)	M (Mature)	Full age for species					U	Not suitable for retention	<10		
L.b.d	Direction of lowest branch	OM (Over Mature)	Beyond life expectancy & in decline									
U.l.e	Useful life expectancy (yrs)	V/A (Veteran/Ancient)*	Ancient or high conservation value	*(Veteran/Ancient RPA afforded 15x stem diameter in accordance with industry best practice)				*P - Tree on private land*	*G - Group*	*H - Hedge*	*Tree is not on topographical survey and postion remains indicativ	

Tree No.	Tag No.	Species	Botanical Name	H (m)	Stem Dia.	No of Stems	Crown Spread (m)				C.C (m)	L.B.H (m)	L.B.D	Age	Physiological	Structural	Comments	Recommendatons	U.L.E	Cat.	RPA (m2)	RPA Radial distance (m)
							N	E	S	W												
94	N/a	Scots Pine	*Pinus sylvestris*	14	180	1	3	2	2	2	2	3	North	EM	Fair	Fair	Linear group run along northern edge of central group dividing golf course from field, cluster of 2, 1 and 5.	None.	10+	C1	14	2
95	N/a	Scots Pine	*Pinus sylvestris*	14	180	1	3	2	2	2	4	4	North	EM	Fair	Fair	Linear group run along northern edge of central group dividing golf course from field, cluster of 2, 1 and 5.	None.	10+	C1	14	2
96	N/a	Scots Pine	*Pinus sylvestris*	14	180	1	3	2	1	2	4	4	North	EM	Fair	Fair	Linear group run along northern edge of central group dividing golf course from field, cluster of 2, 1 and 5.	Fell to facilitate development proposal.	10+	C1	14	2
97	N/a	Scots Pine	*Pinus sylvestris*	15	190	1	3	2	1	2	2	3	North	EM	Fair	Fair	Linear group run along northern edge of central group dividing golf course from field, cluster of 2, 1 and 5.	Fell to facilitate development proposal.	10+	C1	18	2
98	N/a	Scots Pine	*Pinus sylvestris*	15	200	1	3	2	2	2	2	3	North	EM	Fair	Fair	Linear group run along northern edge of central group dividing golf course from field, cluster of 2, 1 and 5.	Fell to facilitate development proposal.	10+	C1	18	2
99	N/a	Scots Pine	*Pinus sylvestris*	14	200	1	3	2	2	2	2	2	North	EM	Fair	Fair	Linear group run along northern edge of central group dividing golf course from field, cluster of 2, 1 and 5.	Fell to facilitate development proposal.	10+	C1	18	2
100	N/a	Scots Pine	*Pinus sylvestris*	14	190	1	3	2	1	1	2	2	North	EM	Fair	Fair	Linear group run along northern edge of central group dividing golf course from field, cluster of 2, 1 and 5.	Fell to facilitate development proposal.	10+	C1	18	2
101	N/a	Scots Pine	*Pinus sylvestris*	14	200	1	3	2	2	2	2	3	North	EM	Fair	Fair	Linear group run along northern edge of central group dividing golf course from field, cluster of 2, 1 and 5.	Fell to facilitate development proposal.	10+	C1	18	2
G102	174-222	Birch (Group)	*Betula*	16	180	1	4	3	2	3	3	3	South	SM	Fair	Poor	Linear group of 48 extending length of central group dividing golf course from field, low quality group growing in close proximity, no space for future growth and development, low retention quality, most westerly tree in group tagged.	Part removal to facilitate development proposal.	10+	C1	14	2
G103	5317-5346	Scots Pine (Group)	*Pinus sylvestris*	15	220	1	3	2	2	2	2	2	South	EM	Fair	Fair	Linear group of 29 extending length of central group dividing golf course from field.	None.	20+	B1	23	3
G104	5347	Mixed species	*N/a*	14	200	1	4	4	4	4	0	0	North	EM	Fair	Fair	Mixed species group contains 110 oak and beech growing along southern section of central group dividing golf course from field, most westerly tree tagged.	Part removal to facilitate development proposal.	20+	B1	18	2
105	5348	Larch	*Larix sp.*	17	220	1	2	2	2	2	3	4	East	EM	Fair	Fair	Single stem.	Fell to facilitate development proposal.	10+	C1	23	3
106	5349	Larch	*Larix sp.*	16	220	1	2	2	2	2	4	4	East	EM	Fair	Fair	Single stem.	Fell to facilitate development proposal.	10+	C1	23	3
107	N/a	Larch	*Larix sp.*	16	210	1	2	3	2	5	4	4	West	EM	Fair	Fair	Single dense ivy clad stem.	Fell to facilitate development proposal.	10+	C1	18	2
108	5351	Sycamore	*Acer pseudoplatanus*	16	350	1	6	4	6	5	0	2	South	EM	Fair	Fair	Single dense ivy clad stem, heavy epicormic growth, symetric canopy.	None.	20+	B1	55	4
109	5352	Sycamore	*Acer pseudoplatanus*	16	300	1	2	1	4	3	2	2	West	EM	Fair	Fair	Single dense ivy clad, asymmetric supressed canopy.	None.	10+	C1	41	4
110	5353	Sycamore	*Acer pseudoplatanus*	9	120	1	2	2	2	2	0	0	West	SM	Poor	Poor	Single ivy clad stem has lost top.	Allow to naturally decline in current location.	<10	U	7	2
111	5354	Sycamore	*Acer pseudoplatanus*	15	260	1	2	5	4	1	1	1	East	SM	Fair	Poor	Single stem, heavily supressed canopy east.	None.	10+	C1	28	3
112	5355	Sycamore	*Acer pseudoplatanus*	15	160	1	2	2	2	2	1	1	West	SM	Fair	Poor	Single stem, ivy clad into crown.	None.	10+	C1	10	2
113	5356	Alder	*Alnus spp.*	11	230	1	3	4	4	4	0	0	South	EM	Fair	Fair	Single stem, dense canopy, 113-120 extend along southern edge of group dividing golf course from field.	Fell to facilitate development proposal.	20+	B1	23	3

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Stem Dia.	Stem diameter (mm)	SM (Semi-mature)	First third of life expectancy	Fair	Intervention may improve health	Fair	Defects may require intervention	B	Moderate value and conservation		20+	2	Mainly landscape
C.c	Crown clearance (m)	EM (Early mature)	Stage before maturity	Poor	Serious ill health or dying	Poor	Dangerous or no remedy	C	Low value and conservation		10+	3	Mainly cultural
L.b.h	Lowest branch height (m)	M (Mature)	Full age for species					U	Not suitable for retention		<10		
L.b.d	Direction of lowest branch	OM (Over Mature)	Beyond life expectancy & in decline										
U.l.e	Useful life expectancy (yrs)	V/A (Veteran/Ancient)*	Ancient or high conservation value	*(Veteran/Ancient RPA afforded 15x stem diameter in accordance with industry best practice)				*P - Tree on private land*	*G - Group*	*H - Hedge*	**Tree is not on topographical survey and postion remains indicativ*		

Tree No.	Tag No.	Species	Botanical Name	H (m)	Stem Dia.	No of Stems	Crown Spread (m)				C.C (m)	L.B.H (m)	L.B.D	Age	Physiological	Structural	Comments	Recommendatons	U.L.E	Cat.	RPA (m2)	RPA Radial distance (m)
							N	E	S	W												
114	5357	Alder	*Alnus spp.*	12	260	1	3	4	4	3	2	2	West	EM	Fair	Fair	Single stem, symetric canopy.	Fell to facilitate development proposal.	20+	B1	28	3
115	5358	Alder	*Alnus spp.*	12	210	1	2	2	2	2	2	2	South	EM	Fair	Fair	Single stem, symetric canopy from 2m.	Fell to facilitate development proposal.	20+	B1	18	2
116	5359	Alder	*Alnus spp.*	12	240	1	2	2	3	3	3	2	West	EM	Fair	Fair	Single stem, symetric crown from 2m.	Fell to facilitate development proposal.	20+	B1	28	3
117	5360	Alder	*Alnus spp.*	12	220	1	2	2	3	2	0	0	South	EM	Fair	Fair	Single stem, symetric crown from 2.5m.	Fell to facilitate development proposal.	20+	B1	23	3
118	5361	Alder	*Alnus spp.*	12	220	1	2	2	3	2	0	0	South	EM	Fair	Fair	Single stem, symertic crown from 2m.	Fell to facilitate development proposal.	20+	B1	23	3
119	5362	Alder	*Alnus spp.*	12	220	1	1	2	3	2	2	3	South	EM	Fair	Fair	Single stem, symetric crown from 2m.	Fell to facilitate development proposal.	20+	B1	23	3
120	5363	Alder	*Alnus spp.*	12	240	1	2	2	3	2	2	2	West	EM	Fair	Fair	Single stem, symetric crown from 1.5m.	Fell to facilitate development proposal.	20+	B1	28	3
121	5354	Yew	*Taxus baccata*	4	80	2	1	1	1	1	2	1	East	EM	Poor	Poor	Multistem from 0.5m, dieback in upper crown, located in centre of fairway.	Allow to naturally decline in current location.	<10	U	3	1

John Morris Arboricultural Consultancy

Client: GLL PRS Holdco Limited
Site: Deer Park
Howth
Co Dublin

Date: 10th February 2020
Ref: 19-312-01

Tree Root Investigation Report

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Purpose of Document

This report discusses the findings of a tree root investigation that was conducted on land at Deer Park, Howth, on behalf of GLL PRS Holdco Limited.

It evaluates the likely extent of root growth onto and across the site and provides an assessment of its potential impact upon development proposals.

The aim is to enable to design team to understand constraints posed by tree roots in relation to current proposals and also demonstrate to An Bord Pleanála how trees have been fully considered and incorporated into the final design layout.

Executive Summary

The investigation discovered that roots belonging to offsite trees curtailed at 6.3m west of the boundary stone wall. These roots had grown between cracks in the wall and beneath the foundations to a depth of 1540mm.

The investigation also discovered roots at the outer edge of Root Protection Areas (RPAs) for onsite trees.

It is not believed the proposed layout will adversely impact offsite trees.

The proposed layout is likely however to require removal of a small number of low quality onsite trees, as it will not be possible to excavate within RPAs, without causing adverse physiological or structural damage to trees.

John Morris Arboricultural Consultancy

Contents

Appendicies

1 – The Influence of Soils and Species on Tree Root Depth (*Forestry Commission*)

Attachments

Document Title	Document Reference	Supplied by
Trial Hole Locations	19-312-02	John Morris Arboricultural Consultancy
Trial Hole Elevation Drawing	19-312-03	
Tree Schedule	19-279-01	

1. INTRODUCTION

Instruction & Scope

1.1. Instruction was received from Glenveagh Living on 22nd January 2020 to undertake a tree root investigation on their site at Deer Park.

1.2. The aim of the investigation was to establish the extent of neighbouring tree root growth onto the site and to assess on site tree root growth in relation to current design proposals, along the eastern boundary of the site.

Site Description

1.3. The site at Howth Road (hereinafter referred to as 'the Site') comprises a grass field and is immediately north of Deerpark Golf Course. The Site is separated from Deerpark Golf Course by a shelter belt of semi-mature and early mature native trees between 25 and 30 years old that extend east to west along the southern boundary. A boundary stone wall extends around the north and east perimeter of the Site, with a mature avenue of trees located beyond the eastern boundary. The Site is bound by Howth Road (R105) to the north, the entrance road to Howth Castle to the east, Deerpark Golf Course to the south and residential dwellings to the west. (Figure 1).

1.4. Adjacent to the Howth Road to the north, the Site is at a level of approximately +6.500m and gradually rises to a level of +14.000m towards the Deer Park Golf Course, with mature trees beyond the eastern boundary located on land that is c.840mm above the Site itself.

Figure 1. Application boundary outlined in red, extent of Applicants land ownership outlined in blue (Google Earth, 2020).

Design Proposal

1.5. The current proposal is for a Strategic Housing Development (SHD) scheme with associated parking, utilities and landscaping.

2. BACKGROUND

Trees

2.1. Trees most likely impacted by the current proposals include those offsite just beyond the eastern boundary stone wall (Nos. 25, 26, 27 & 28). A further group of trees (Nos. 105-114) that are growing on the site itself are also likely to be impacted by current proposals.

2.2. A copy of the site Tree Constraints Plan (TCP) (Ref:19-279-02) and accompanying schedule (19-279-01) summarising tree data are attached to this report.

Topography

2.3. Site levels rise from +6.5m along the northern boundary to +14m along the middle section of the eastern boundary, adjacent to where trial holes were excavated.

2.4. Offsite trees along the avenue leading to the wider estate are located on ground that is approximately 840mm higher than the site itself.

Methodology

2.5. A series of trial holes were marked at the locations shown on the attached Trial Hole Locations drawing (Ref: 19-312-03). The location of trial holes was selected based on theoretical Root Protection Areas (RPAs) of trees that were calculated following a survey of the site by John Morris Arboricultural Consultancy on 21st and 22nd November 2019.

2.6. The general location of trial holes was agreed in advance of the site visit with the project landscape architect.

2.7. Trial holes were excavated using an 'Air Spade', which blast high pressure air allowing removal of soil from around roots without causing any physiological or structural damage to trees. Initial trial holes were 900mm in length and 600mm wide, and to an average depth of 700mm. Where tree roots were present, further excavations were conducted to trace the full lateral extent of those roots across the site.

Limitations

2.8. Whilst the information in this report aims to provide an overview of the likely extent of tree rooting environments, investigations were limited to the trial holes as shown on the attached Trial Hole Location plan and are not necessarily a true reflection of roots across other areas of the site.

2.9. Features of a site such as topography and soil conditions can greatly influence growth pattern and direction of tree roots.

3. OBSERVATIONS

Observations

3.1. The following tables summarise the data and observations made during the site investigation.

3.2. An indicative drawing (Ref:19-312-04) illustrating observations of investigations at trial holes 1, 2 and 3 can be found attached to this report.

Trial Hole 1	
Location	On site at the base of the boundary stone wall, between trees 25 & 26 (sycamore).
Dimensions	1000mm(l) x 600mm(w) x 700mm(d)
Roots <25mmØ	A dense clump of fibrous roots was visible from a depth of 200mm to 400mm. These roots were growing from cracks in the stone wall. A single root 22mmØ was growing from a crack in the wall at a depth of 400mm.
Roots >25mmØ	Non fibrous lateral roots measuring 25mmØ were visible from a depth of 400mm to 700mm. These roots were growing from cracks in the stone wall and from beneath the stone foundations of the wall in a westerly direction.
Observations	The majority of a tree's roots are generally expected to be found in the upper 600mm of soil, however this can vary depending on soil conditions, species and surroundings. Trees 25 & 26 are located approximately 840mm above the site, east of the boundary stone wall. The location of fibrous roots at a depth of 200-400mm on the site indicated that roots had grown to a total depth of around 1240mm, whilst non fibrous roots >25mmØ had grown to a total depth of approximately 1540mm. Roots are opportunistic in search of water and nutrients and it is not uncommon to find roots at depths >600mm if conditions are favourable. In this instance well aerated soil, likely containing good levels of oxygen has allowed root growth beyond the foundations of the wall, whilst fibrous roots have been able to exploit small cracks higher in the wall in search of moisture.

Photo 1	 **Excavations at the base of boundary stone wall.**
Photo 2	 **Fibrous roots contained in the upper 200-400mm of soil, that have grown through cracks in the stone wall.**

Photo 3	 **Fibrous roots measuring >5mm.**
Photo 4	 **A root 22mmØ growing through a crack in the stone wall at a depth of 400mm.**

Trial Hole 2	
Location	6.3m from the boundary stone wall (outer edge of RPAs for tree 25 & 26)
Dimensions	1000mm(l) x 600mm(w) x 700mm(d)
Roots <25mmØ	There were very few fibrous roots. The majority of roots were <25mmØ at a depth of 200-400mm.
Roots >25mmØ	A single root 25mmØ was visible at a depth of 300mm.
Observations	Trial hole 2 was excavated at the outer edge of RPAs to understand the lateral extent of root growth onto the site, following the discovery of roots in trial hole 1. The discovery of lateral roots growing in a westerly direction coincided with findings at trial hole 1. A single lateral root 25mmØ that sub divided into smaller diameter roots was found with no other roots >25mmØ. As trees 25 & 26 are the closet offsite trees to the boundary wall, this indicated that a distance of 6.3m is likely to be the greatest distance from the stone wall where roots >25mmØ are located.
Photo 1	 **Trial hole 2 located 6.3m from the boundary stone wall, at the outer edge of RPAs.**

Photo 2	 **An aerial view of trial hole 2, showing a single lateral root that then subdivides into smaller diameter roots.**
Photo 3	 **The largest visible root in trial hole 2 was 25mmØ. This root then subdivides into smaller diameter roots.**

Trial Hole 3	
Location	9.3m from the boundary stone wall.
Dimensions	1000mm(l) x 600mm(w) x 700mm(d)
Roots <25mmØ	The only roots present were located in the upper 100-200mm of soil. These roots belonged to surface vegetation and weeds.
Roots >25mmØ	No roots visible
Observations	The only visible roots originated from surface vegetation and weeds, therefore confirming that tree roots belonging to trees 25 & 26 ended shortly after trial hole 2, at the outer edge of RPAs.
Photo 1	 **Roots belonging to surface vegetation in trial hole 3.**

Photo 2	 **Surface vegetation being pulled from around trial hole 3, to confirm root ownership.**

Trial Hole 4	
Location	A linear trench was excavated connecting trial hole 1 and 2.
Dimensions	5000mm(l) x 600mm(w) x 700mm(d)
Roots <25mmØ	There were few fibrous roots or roots <25mmØ visible
Roots >25mmØ	Two lateral roots 25mmØ were visible
Observations	Two lateral roots 25mmØ were visible growing in a westerly directly from trial hole 1. These roots grew from a depth of 600mm at the outer edge of trial hole 1 in a gentle sloping incline, levelling off at a depth of 200mm-400mm at around 3m from the boundary stone wall.
Photo 1	 **Excavation of linear trench from trial hole 1 to trial hole 2, to trace lateral roots across the site.**

Photo 2	 **Two lateral roots growing a westerly direction from trial hole 1.**
Photo 3	 **Lateral root 25mmØ in linear trench connecting trial hole 1 and 2.**

Trial Hole 5	
Location	13.7m south of trial hole 1, at base of boundary stone wall.
Dimensions	600mm(l) x 600mm(w) x 700mm(d)
Roots <25mmØ	No roots
Roots >25mmØ	No roots
Observations	A trial hole was excavated adjacent to G29 (a younger offsite mixed species group comprising sycamore, beech, ash, elder and laurel). Despite well aerated soil similar to previous trial holes there were no roots visible. This may indicate that younger specimens have been unable to breach the boundary stone wall. Trees within G29 are also set back from the boundary wall, in comparison to trees 25 & 26, which grow within 500mm of the wall. This may also indicate the further trees are from the wall, the less likely roots are able to breach the boundary stone wall.
Photo 1	 **No roots were visible in trial hole 4.**

Trial Hole 6 – General Exploratory Excavations	
Location	General exploratory excavations were carried out around tree 105-112.
Dimensions	N/a
Roots <25mmØ	Yes (see observations)
Roots >25mmØ	Yes (see observations)
Observations	General excavations were undertaken around trees 105-112, as indicated by the red arrows in photo 1 and 2. The purpose of these excavations was to establish if any roots >25mmØ were present in areas likely to be impacted by current proposals. A number of roots >25mmØ were found at the very edge of RPAs for trees 106, 107 & 108. It was difficult to establish which trees these roots belonged to, due to the clustered nature and high density of trees growing in this area of the site. The presence of roots >25mmØ at the outer edge of RPAs for trees 106, 107 & 108, presents a strong argument that theoretical RPAs are indicative of actual rooting environments of trees in this location and should therefore be afforded protection in respect of the proposed layout. This may be as a result of more level ground conditions in this area of the site, allowing roots to naturally explore their surrounding environment without any impediment.
Photo 1	 **Red arrow indicating general area of excavations in proximity to trees 105-112 (photo taken facing south).**

Photo 2	 **Red arrow indicating general area of exploratiry excavations in proximity to trees 105-112 (photo taken facing north).**
Photo 3	 **Roots >25mmØ were found throughout this area of the site.**

Photo 4	 **A root 25mmØ at the outer edge of RPAs**

4. DISCUSSION & CONCLUSION

Results

4.1. The presence of both fibrous roots and those >25mmØ in trial holes 1 and 2 confirms that roots belonging to offsite trees have grown onto the site. However, the absence of any form of tree roots in trial hole 3 indicates that roots have been unable to grow beyond 6.5m, at the outer edge of theoretical RPAs. This was confirmed by excavating a linear trench from trial hole 1 to trial hole 2.

4.2. Although the presence of roots at a depth of approximately 1540mm was beyond that which is normally expected of the species (see Appendix 1), it was not surprisingly given a) the close proximity of trees to the boundary stone wall, and b) how well aerated the soil was.

4.3. The absence of any roots in trial hole 5 indicates that younger trees are less capable of breaching the boundary stone wall, however distance from the wall may also play a role. Whilst trees growing just 0.5m from the wall, may have had no option but to explore soils surrounding and beneath the boundary stone wall, it may be argued that those located further back have no need to do so, being able to obtain ample water and nutrients from soils in ground beyond the wall.

4.4. The presence of roots >25mmØ diameter throughout exploratory trial hole 6 and to the outer edge of RPAs, was unsurprising given the relatively level ground and favourable well aerated soil conditions. Whilst it was difficult to confirm ownership of tree roots in this area due to the clustered nature and higher density of trees, conclusions were drawn based on the direction of root growth in relation to the main stem.

Impact on Design Layout

4.5. The current proposed layout will require the excavation of earth beyond approximately 9.3m west of the boundary stone wall.

4.6. Given no tree roots >25mmØ were found beyond approximately 6.3m in trial hole 2, the proximity of the proposed layout is highly unlikely to adversely impact offsite trees in this area of the site. Depending on land availability across the site, it may be even be possible to build closer than proposed, just within theoretical RPAs.

4.7. Due to the presence of structural roots and those >25mmØ throughout the area of trial hole 6 (trees 104-112) it is recommended that no excavations take place beyond current RPAs. It should be noted however, that the majority of trees in this area are some of the lowest quality on the site, predominately comprising self-seeded sycamore that have grown in close proximity with no space for future growth and development. The removal of these trees if required, could easily be mitigated with replacement planting of better quality across other areas of the site

Appendix 1 – The Influence of Soils and Species on Tree Root Depth (*Forestry Commission*)

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The Influence of Soils and Species on Tree Root Depth

INFORMATION NOTE

BY PETER CROW OF FOREST RESEARCH NOVEMBER 2005

SUMMARY

There are numerous publications on the root plate dimensions of windthrown trees, but few relate the root depth and spread to the soil types in which the trees were growing. It is well known that different soil types and their properties are an important factor in determining the rooting habit of a tree. This Information Note reviews the available published information and aims to fill in some gaps to produce a guide of plausible rooting depth ranges for a selection of species on soils with different characteristics. By providing information on the likely extent of tree roots, this Note aims to be useful to anyone with an interest in subterranean utilities, objects or features.

INTRODUCTION

The ever-increasing quantity of utilities located below ground has highlighted the need for a greater awareness of tree root distributions and the likelihood of these utilities being affected by subsequent root growth. Similarly, landscape designers, planners and land managers are often interested in the potential distribution of tree roots when considering the preservation of features such as buried archaeological evidence, watercourses, foundations and pavements. In addition, civil engineers need to take into account the potential extent of tree roots when placing mineral caps and soils over landfill and similar reconstructed landscapes.

PUBLISHED DATA

While published data are plentiful, studies of mature tree root systems that have not been uprooted are few. Due to logistical problems, excavations have been restricted to a limited number of species and soil types (Sutton, 1991).

Most of the data collected on root dimensions are therefore derived from mechanically lifted root plates (e.g. Forest Research tree pulling database) or windthrown trees, such as those in south-east England that were uprooted by the storm of October 1987 (Figure 1).

The published data from the windthrown tree surveys (Cutler *et al.*, 1990; Gasson and Cutler, 1990; Gibbs and Greig, 1990) give the soil types encountered and the number of trees recorded on each. However, no analyses of the influence of soil type were made when the root plate dimensions were recorded, and subsequent analysis from the published data is not possible.

Figure 1

A beech tree uprooted by the October 1987 storm showing root plate.

Other methods of root study have involved trenching, soil coring and detailed excavations, for which soil information is usually given. However, the soil variability, the numerous soil classification systems and descriptive terms used further complicate direct comparison of the results. Where published root data have been found with soil description, the values have been added to the tree pulling data to produce a Forest Research root plate database that has subsequently been used in the production of the rooting guide (Table 1, page 6).

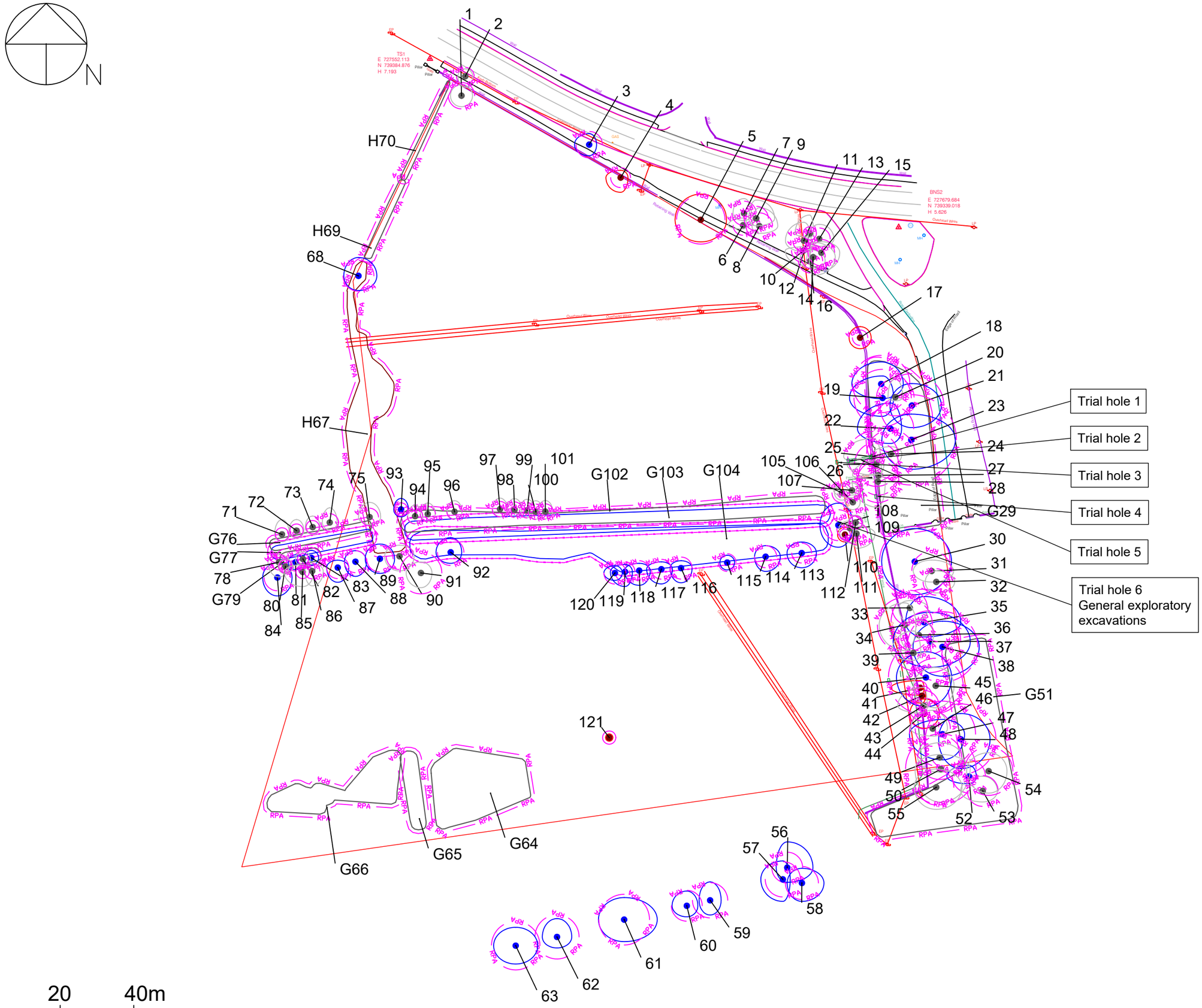
Table 1 Probable rooting depth ranges for selected tree species. For details of soil groups 1–7 see page 5. Soil suitability data adapted from Mitchell and Jobling (1984) and Pyatt *et al.* (2001).

Species		Soil groups							
Scientific name	Common name	1	2	3	4	5	6	7a	7b
Abies grandis	Grand fir*	**	!		!				*
Abies procera	Noble fir*	**	!	!	!	!	!	*	*
Acer campestre	Field maple	**	**		**	!	!	**	***
Acer pseudoplatanus	Sycamore	*	**		!	!	!	!	**
Alnus glutinosa	Alder*	**	!		!		!	!	!
Betula pubescens	Downy birch*	*	!		!	!	!	!	!
Carpinus betulus	Hornbeam*	*	!		!			!	***
Castanea sativa	Sweet chestnut*	*	!		**	**	**	!	***
Fagus sylvatica	Beech	**	!		!	!	!	**	***
Fraxinus excelsior	Ash	*	**		**	*	*	!	***
Juglans regia	Walnut*	*	!		**		!	**	***
Larix decidua	European larch		!		!	**	**	!	**
Larix kaempferi	Japanese larch*	**	!	!		!	!	!	*
Malus sylvestris	Apple*		!		!		!	!	*
Picea abies	Norway spruce	*	!		!		!	!	*
Picea sitchensis	Sitka spruce*	*							
Pinus contorta	Lodgepole pine*		!				!		
Pinus nigra var. *maritima*	Corsican pine		!				!	!	***
Pinus sylvestris	Scots pine*				*	***	***	!	***
Populus alba	White poplar*	**	**		!		!	**	**
Populus tremula	Aspen*	*	!					!	*
Prunus avium	Wild cherry	**	**		!	!	!	!	*
Pseudotsuga menziesii	Douglas fir*	*	**		*	*	*	!	***
Quercus robur	Pedunculate oak*	*			!			!	***
Salix alba	White willow*	**	!	!	!	!		!	!
Thuja plicata	Western red cedar	*	**	!	!			!	*
Tilia cordata	Small leaved lime	!	!		!	!	!	!	***
Tsuga heterophylla	Western hemlock*	*	**		!		!	!	***

* Unlikely if soils are calcareous.
*** Conditions not recommended for growth.
** Not ideal and growth may be impeded (will vary from site to site).
* Not ideal for growth but some values published.
! Values are conjectural (all others values are from database).

Probable rooting depth range for mature trees

<0.5 m <1.5 m <2.5 m <4.0 m
<1.0 m <2.0 m <3.0 m



TITLE:	Tree Root Investigation - Trial Hole Locations
PROJECT / SITE:	Deer Park, Howth
CLIENT:	GLL PRS Holdco Limited
DRAWING REF:	19-312-02
REVISION:	v1
DATE:	10.02.20
SCALE:	1:1000@A3
DRAWN BY:	JM
CHECKED BY:	JL

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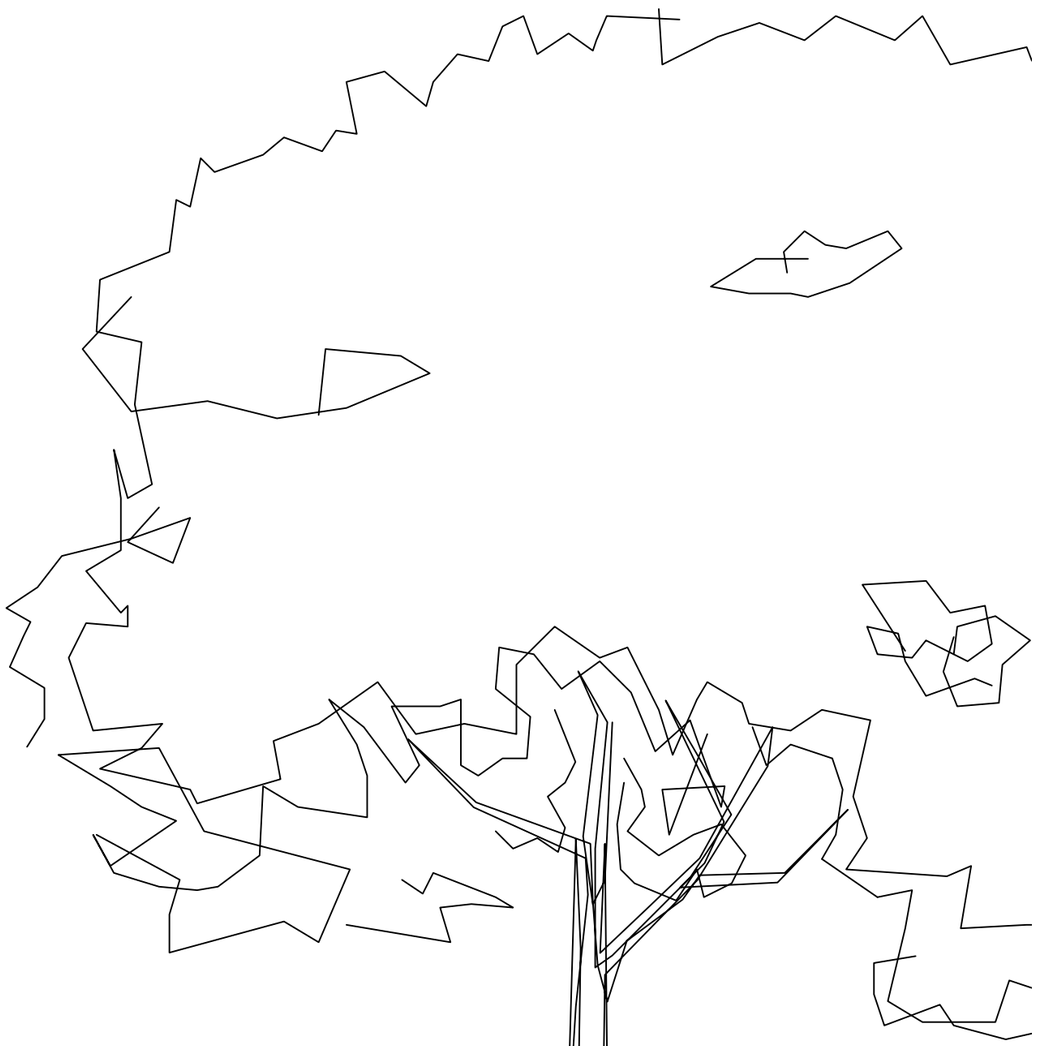
IMPORTANT NOTE: Drawing is indicative and for illustration purposes only. It should not be used for construction purposes - all measurements should be checked on site.



LEGEND

- Fibrous roots < 25mm ø
- Roots 25mm ø
- No roots
- End of RPA (Root Protection Area)

Trial hole 3 (9.3m from wall)

No roots visible

Trial hole 2 (6.3m from wall)

Trial hole 4 (linear trench connecting trial holes 1 & 2)

Trial hole 1

RPA

RPA

RPA

RPA

RPA

700

700

700

700

700

1840

2680

1540

Stone foundations reached at 600mm

TITLE:	Tree Root Investigation - Trial Hole Elevation
PROJECT / SITE:	Deer Park, Howth
CLIENT:	GLL PRS Holdco Limited
DRAWING REF:	19-312-03
REVISION:	v2
DATE:	18.10.2020
SCALE:	Not to scale@A3
DRAWN BY:	JM
CHECKED BY:	JL

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